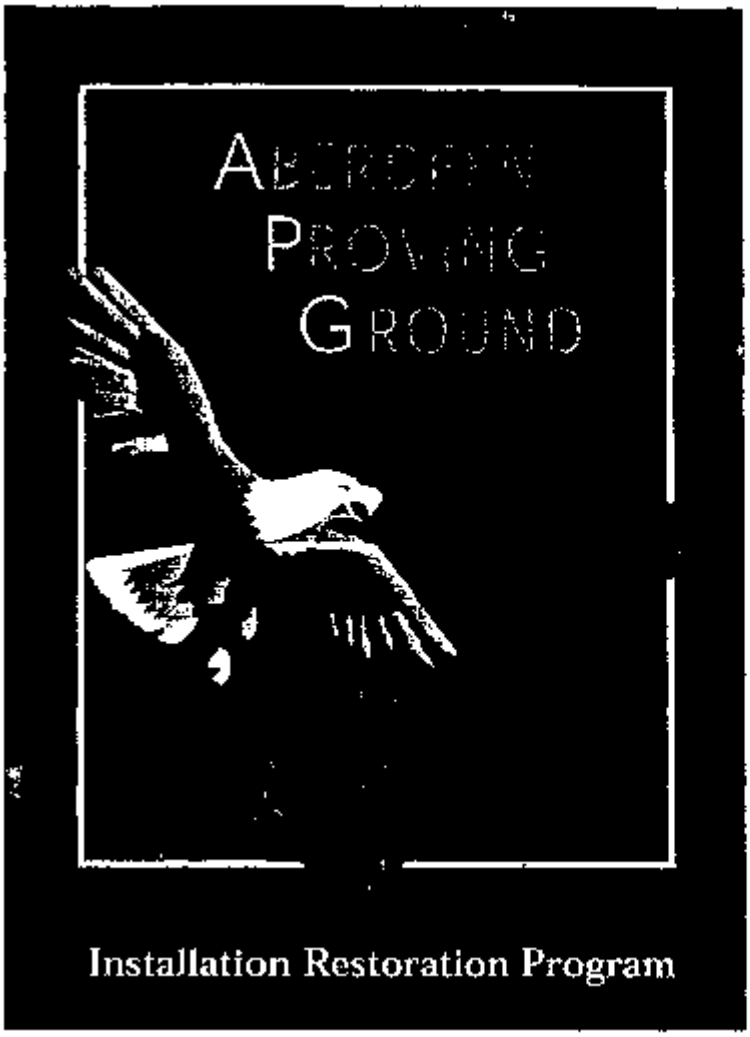
EPA/ROD/R03-01/025
2001

EPA Superfund
Record of Decision:

ABERDEEN PROVING GROUND (EDGEWOOD AREA)
EPA ID: MD2210020036
OU 08
EDGEWOOD, MD
09/28/2001



J-FIELD STUDY AREA

Record of Decision
Final Remedial Action
Final
September 2001

01P-1676

U.S. Army Garrison
Aberdeen Proving Ground, Maryland

RECORD OF DECISION
FINAL REMEDIAL ACTION
J-FIELD STUDY AREA

Edgewood Area
Aberdeen Proving Ground, Maryland

Prepared for

DIRECTORATE OF SAFETY, HEALTH, AND ENVIRONMENT
Environmental Conservation and Restoration Division
Installation Restoration Program
U.S. Army Garrison Aberdeen Proving Ground, Maryland

September 2001

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

1,1,2,2-TeCA	1,1,2,2-tetrachloroethane
1,1,2-TCA	1,1,2-trichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,2-DCE	1,2-dichloroethene
ACLs	Alternate Concentration Levels
APG	Aberdeen Proving Ground
APG-EA	Aberdeen Proving Ground-Edgewood Area
APGSCC	Aberdeen Proving Ground Superfund Citizens Coalition
ARARs	Applicable or Relevant and Appropriate Requirements
ARS	Alternative Remedial Strategy
AWQC	Ambient Water Quality Criteria
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COMAR	Code of Maryland Regulations
COPCs	Contaminants of Potential Concern
CWA	Clean Water Act
CWM	Chemical Warfare Material
CZMA	Coastal Zone Management Act
DNAPL	Dense Non-Aqueous Phase Liquid
DOD	Department of Defense
DOT	Department of Transportation
DSERTS	Defense Site Environmental Restoration Tracking System
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
GCW	Groundwater Circulation Wells
GIS	Geographical Information System
HE	High Explosives
HHRA	Human Health Risk Assessment
HRC	Hydrogen Release Compound
LTM	Long Term Monitoring
LUC	Land Use Control

LIST OF ACRONYMS (continued)

LUCIP	Land Use Control Implementation Plan
MCLGs	Maximum Contaminant Level Goals
MCLs	Maximum Contaminant Levels
MDE	Maryland Department of the Environment
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESAHP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operations and Maintenance
OB/OD	Open Burning/Open Detonation
OSHA	Occupational Safety and Health Administration
PCE	tetrachloroethene
POTWs	Publicly Owned Treatment Works
PSB	Protective Soil Blanket
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SECs	Shoreline Erosion Controls
SOU	Soil Operable Unit
TAGs	Technical Assistance Grants
TBP	Toxic Burning Pit
TCE	trichloroethene
TI	Technical Impracticability
USAEC	U.S. Army Environmental Center
USC	United States Code
UVB	Unterdruck-Verdampfer-Brunnen
UXO	Unexploded Ordnance
VC	Vinyl Chloride
VOCs	Volatile Organic Compounds
VX	methylphosphonothioate

ABERDEEN PROVING GROUND
FINAL REMEDIAL ACTION
J-FIELD STUDY AREA
FINAL
RECORD OF DECISION

September 2001 Aberdeen Proving Ground, Maryland

1. DECLARATION OF THE RECORD OF DECISION (ROD)

1.1 SITE NAME AND LOCATION

J-Field Study Area

Edgewood Area

Aberdeen Proving Ground (APG), Maryland

The Defense Site Environmental Restoration Tracking System (DSERTS) number for the J-Field Surficial Aquifer is EAJF05-B. DSERTS numbers for other areas covered under this Record of Decision (ROD) and those areas covered under previous actions are listed in Table 1.

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the J-Field Study Area. Previous removal and remedial actions have been implemented to address the J-Field Soil Operable Unit (SOU). Remedial actions under this ROD will address the Surficial Aquifer, the Confined Aquifer, and remaining soil areas, except for limited areas that remain active, in the J Field Study Area. No further action beyond those presented herein and those underway in accordance with prior RODs is to be taken for remaining soil areas in the J-Field Study Area. A listing of these soil areas and actions at J-Field is given in Table 1. Available data from Remedial Investigation (RI) activities indicate that the chemical contaminants in these soil areas do not pose a significant risk to human health or the environment under current Army access controls and land use restrictions. Isolated unexploded ordnance and chemical warfare materiel (UXO/CWM) may be present, although detailed review of available historical documents and field investigations (geophysical surveys and RI/FS activities) show no evidence of extensive UXO/CWM disposal areas remaining at J-Field. However, the potential presence of these items could pose a risk. These risks are not addressed under this CERCLA action.

Table 1
Summary of DSERTS Sites Addressed by J-Field Remedial Actions

DSERTS Site		Soil OU ROD/ ESD[a]	J-Field Study Area		Projected ROD Date FY
Name	Number		Action	No Further Action	
J-Field Study Area	EAJF00				2001
White Phosphorus Burning Pit[b]	EAJF01				
Prototype Building	EAJF02			X	2001
Riot Control Burning Pit	EAJF03			X	2001
Robins Point Demolition Ground[b]	EAJF04				
Toxic Burn Pits[a]	EAJF05	X		X	1996
Toxic Burns Pits – Southern Main Pits Overall	EAJF05-A	X		X	1996
Surficial Aquifer[c]	EAJF05-B		X		2001
South Beach Demolition Ground	EAJF06			X	2001
South Beach Trench	EAJF07			X	2001
X1 Ruins Sites, SW of Intersection	EAJF08			X	2001
Drainage Grid (Area A)	EAJF09			X	2001
Ford's Point Firing Position (Area B)	EAJF010			X	2001
Ruins Site NE of Intersection (Area C)	EAJF011			X	2001
Ruins Site Area across from WPP	EAJF012			X	2001
Swamp 400 ft East of Ruins Site (Area D)	EAJF013			X	2001
Robins Point Tower Site	EAJF014			X	2001
Titanium Pits Site	EAJF015			X	2001

[a]The ROD has been modified by an ESD (2001)

[b]Portions remain active; will be closed when appropriate

[c]Includes the Confined Aquifer actions

Several limited areas at J-Field remain active for emergency response detonation operations. These areas, the White Phosphorus Burning Pit and the Robins Point Demolition Ground, will be managed and closed in coordination with environmental regulators under the appropriate environmental program(s) when their use is no longer required for APG's mission.

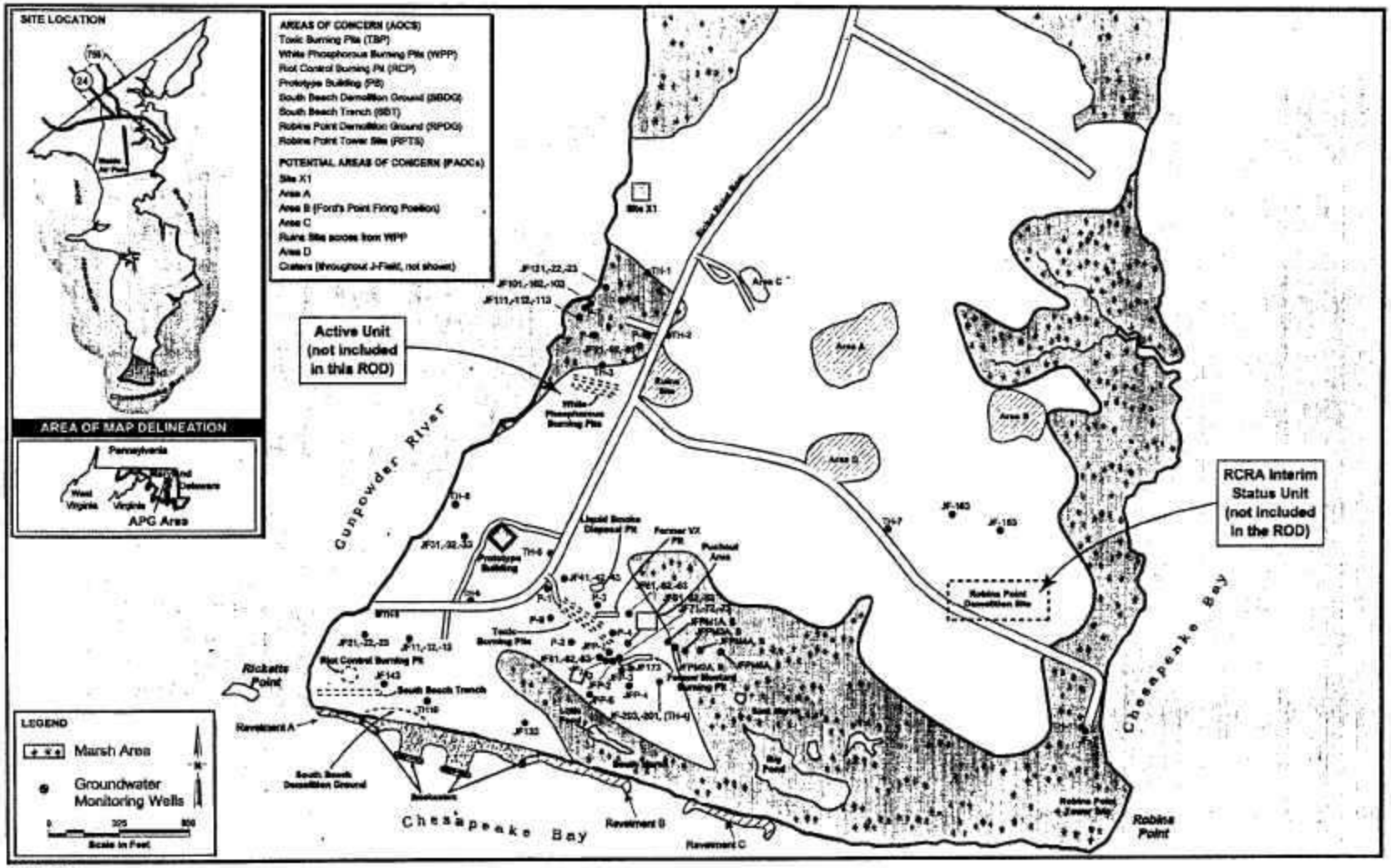
This remedial action was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site. The Maryland Department of the Environment (MDE) concurs with this remedy.

1.3 ASSESSMENT OF THE SITE

Volatile organic compounds (VOCs) are the primary chemicals found in the J-Field Surficial Aquifer. These compounds include 1,1,2,2-tetrachloroethane (1,1,2,2-TeCA), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethene (1,2-DCE) (total), tetrachloroethene (PCE), 1,1,2-trichloroethane (1,1,2-TCA), trichloroethene (TCE), and vinyl chloride (VC). The VOC-contaminated plume is confined to the Toxic Burning Pit (TBP) area located in the southwestern portion of J-Field (Figure 1). The VOC-contaminated plume is shown in the enlarged TBP area map in Figure 2.

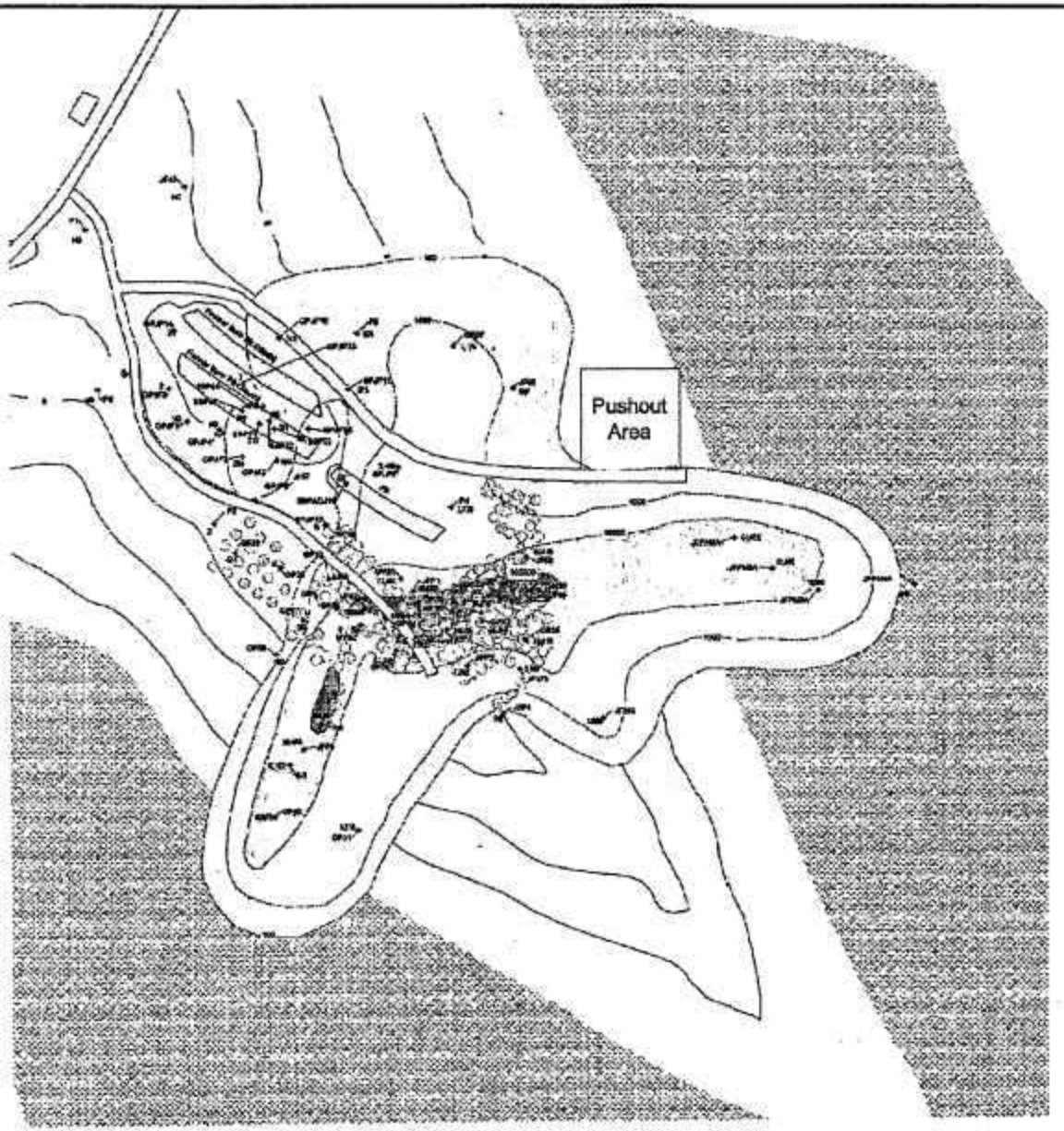
Dense Nonaqueous Phase Liquid (DNAPL) is present in the Surficial Aquifer. Based on this, a Technical Impracticability (TI) Evaluation has been prepared and a TI Waiver has been issued by the Army and the U.S. Environmental Protection Agency (EPA). In addition, as is discussed in Section 2.2.2, contamination was introduced into the Confined Aquifer from the Surficial Aquifer through leaky wells in past years. Two of the faulty wells have been abandoned and replaced (WESTON, 2001b) and one additional well is to be abandoned and replaced as part of the Selected Remedy presented in this ROD. Monitoring of the Confined Aquifer will also continue as part of this remedy. Remaining soil areas within the J-Field Study Area are listed in Table 1. No further action beyond those presented in this ROD and those underway in accordance with previous RODs is to be taken for groundwater or remaining soil areas in the J-Field Study Area except for active areas as previously noted.

The Human Health Risk Assessment (HHRA) evaluated hypothetical future residential use scenarios to identify contaminants of potential concern (COPCs). The Risk Assessment concluded that cumulative carcinogenic and non-carcinogenic risks associated with hypothetical child and adult resident exposures to groundwater at J-Field were well above EPA's target ranges for health protection. The ecological risk assessment indicated that there are currently no significant ecological risks associated with discharge of the Surficial Aquifer groundwater to the freshwater marsh. The ecological risk assessment also indicated that there is future potential for ecologic effects in the freshwater marsh.



01P-1524

FIGURE 1 LOCATIONS OF TOXIC BURNING PITS AREA WITHIN J-FIELD



LEGEND

- Monitoring Well w/ concentration in µg/L (ND indicates non-detect)
- Topographic Contour
- Freshwater Marsh
- Roads
- Phytoremediation Tree

Groundwater concentrations (µg/L)

- >100,000
- >10,000
- >1,000
- >100

Plume configuration based on composite data collected between 1997 and 1999.

NOTES:

1. Basemap information adapted from an ARCINFO Geographic Information System (GIS) database by WESTON.
2. Basemap features referenced to UTM Coordinate System, Zone 18, NAD 1927, meters.

Scale in Feet

J-Field
Aberdeen Proving Ground
Edgewood, Maryland

01P-0230-6

FIGURE 2 CONTAMINATED PLUME SHOWING TOTAL VOC CONTOURS (1999 SAMPLING RESULTS)

The Selected Remedy under this ROD will represent the best balance of required and preferred features for the J-Field Study Area, as defined by CERCLA guidance and the NCP.

1.4 DESCRIPTION OF THE SELECTED REMEDY

Based on the site assessment, the Army and the EPA developed response actions for this site. As described in the TI Evaluation, the results of the investigations in the Surficial Aquifer indicate that DNAPL is present in the Surficial Aquifer at the site. The TI Evaluation considered the following options for the Surficial Aquifer:

- Treatment of entire contaminated plume.
- Containment of residual and mobile contaminant.
- If DNAPL containment is achievable, treatment of the remaining portion of the plume.

All of these options were found to be technically impracticable. Treatment of the entire plume is not practicable as shown from the results of the Treatability Studies (discussed in Subsection 2.2.2). Limitations in groundwater pumping and extraction rates from the Surficial Aquifer and the limited influence of in situ technologies, both due to the low permeability of aquifer materials, make treatment impracticable. Engineered containment of the DNAPL would be accomplished through placing a slurry wall or similar impervious subsurface barrier around the perimeter of the hot spot of the plume. Dewatering of the area inside the wall or capping the contained area with an impermeable material would be required in conjunction with containment. If achievable, engineered containment may have offered some environmental benefit; however, it is not practicable due to prohibitive costs associated with the large area to be contained and costs associated with unexploded ordnance (UXO) clearance. Excavation of the DNAPL area is also not practicable. All areas disturbed for construction of containment systems or for excavation of materials would require clearance, removal, and disposal of any ordnance items or CWM encountered. Previous experience at the J-Field SOU has shown that the potential for ordnance items can make complete removal of materials cost-prohibitive. Removal of the DNAPL through excavation would not be practicable. Therefore, it will not be possible to meet Applicable or Relevant and Appropriate Requirements (ARARs) in the Surficial Aquifer. Details of this discussion are found in the TI Evaluation (WESTON, 2001a).

As part of the TI Evaluation, an Alternative Remedial Strategy (ARS) was developed to reduce risk to human health and the environment at the J-Field Study Area. This ARS includes establishing Institutional Controls, continuation of phytoremediation, monitoring biodegradation processes, abandonment and replacement of Confined Aquifer well JF-51, possible addition of a supplement to the replacement well for JF-51 to foster degradation of the isolated contamination at JF-51 in the Confined Aquifer, continued monitoring of the Confined Aquifer, and implementation of free phase DNAPL recovery in the localized area where DNAPL was observed, temporary Geoprobe® well GP-53.

The goal of this remedy is to reduce the contaminant mass in the J-Field Surficial Aquifer through DNAPL recovery, phytoremediation, and natural processes, to eliminate exposure to the groundwater and to control off-site

contaminant migration from the Confined Aquifer.

The ARS consists of the following:

- CERCLA 5-Year Review.
- Restriction of Surficial Aquifer groundwater use, and the use of untreated upper Confined Aquifer groundwater unless it meets all applicable standards and criteria, in order to prevent exposure risks associated with contaminated groundwater.
- Prohibition of unauthorized excavation and well installation at the site.
- Provisions for implementation, monitoring, reporting, and enforcement of institutional controls will be specified in the Land Use Control Implementation Plan (LUCIP).
- Planting additional trees over a minimum of a 1-acre area to further extend the phytoremediation zone.
- Periodic sampling, monitoring, and maintenance of phytoremediation trees, which may include measurements of sap flow, tree tissue, and/ or other sampling, and planting of new trees as needed to replace damaged or dead ones. Following planting, the health of the trees would be assessed periodically as the trees become established on the site. Fertilizer and soil amendments may continue to be required, and it may be necessary to prune the trees during their growing season.
- Groundwater sampling for COPCs and monitoring of attenuation and biodegradation parameters to help determine whether the plume is stable or migrating, and the direction of migration of the plume.
- Abandonment and replacement of Confined Aquifer Well JF-51.
- Implementation of free phase DNAPL recovery in the localized area where DNAPL was observed, temporary Geoprobe® well GP-53.
- The addition of a supplemental material to foster degradation of the isolated contamination at JF-51 in the Confined Aquifer will be considered in the Remedial Design.
- Monitoring of the Confined Aquifer.
- Monitoring of the freshwater marsh.
- Periodic maintenance inspections of the shoreline area for indications of erosion.

1.5 STATUTORY DETERMINATIONS

This final remedial action is protective of human health and the environment and is intended to provide adequate protection for the J-Field Study Area. This final remedial action is intended to comply with federal and state ARARs for this action (except as waived with the TI Waiver), and is cost-effective. A TI Waiver from selected Federal and State ARARs has been issued by the Army and the EPA. (Appendix C, J-Field Study Area Feasibility Study ! TI Evaluation, WESTON, 2001a). ARARs to be waived are the Federal Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) (40 Code of Federal Regulations [CFR] 141.11-12, 141.50-51, and 141.61-62), which were adopted by the State of Maryland in Code of Maryland Regulations (COMAR) 26.04.01 Regulation of Water Supply, Sewage Disposal, and Solid Waste; and State of Maryland Annotated Code Title 9 ! Water Pollution Control (sections 9-302 and 9-322) as implemented by COMAR 26.08.02.09 Groundwater Quality Standards. Other risk-based criteria listed in the TI Evaluation will not be reached in the TI Zone. ARARS to be waived for the Surficial Aquifer are presented in Table 2.

This remedy uses permanent solutions as currently available to the maximum extent practicable for this site. Treatment will be used to the extent practicable by removing free phase DNAPL from localized areas and groundwater treatment through phytoremediation and natural processes. Because this remedy will result in hazardous substances above health-based levels remaining on-site, a CERCLA Five-Year Review will be conducted to ensure that the remedy continues to provide adequate protection of human health and environment within 5 years after commencement of the remedial action and every 5 years thereafter as appropriate.

Table 2

Chemical-Specific ARARs to be Waived in the Surficial Aquifer

Act	Description	Status	Waiver
Federal Safe Drinking Water Act 40 CFR 141.11-12,141.61-62	Sets maximum contaminant levels allowable for drinking water.	Relevant and Appropriate	MCLs and non-zero MCLGs to be waived for: – Benzene – Carbon tetrachloride – Chlorobenzene – 1,2-Dichloroethane – 1,1-Dichloroethene – cis-1,2-Dichloroethene – trans-1,2-Dichloroethene – Tetrachloroethane – Trichloroethene – Vinyl chloride – Arsenic – Cadmium – Chromium – Antimony – Selenium – Thallium – Cyanide (free) – Nitrate (as Nitrogen)
State of Maryland Regulation of Water Supply, Sewage Disposal, and Solid Waste COMAR 26.04.01	Sets maximum contaminant levels allowable for drinking water.	Relevant and Appropriate	MCLs and non-zero MCLGs to be waived for: – Benzene – Carbon tetrachloride – Chlorobenzene – 1,2-Dichloroethane – 1,1-Dichloroethene – cis-1,2-Dichloroethene – trans-1,2-Dichloroethene – Tetrachloroethane – Trichloroethene – Vinyl chloride – Arsenic – Cadmium – Chromium – Antimony – Selenium – Thallium – Cyanide (free) – Nitrate (as Nitrogen)

Table 2

Chemical-Specific ARARs to be Waived in the Surficial Aquifer (Continued)

Act	Description	Status	Waiver
State of Maryland Annotated Code Title 9 - Water Pollution Control as implemented by COMAR 26.08.02.09 Groundwater Quality Standards	State groundwater anti-degration policy	Relevant and Appropriate	Numerical Standards as implemented by COMAR 26.08.02.09 Groundwater Quality Standards

John C. Doesburg
Commanding General
U.S. Army Aberdeen Proving Ground

27Sep01
Date

Abraham Ferdas
Director, Hazardous Site Cleanup Division
U.S. Environmental Protection Agency,
Region III

9/28/01
Date

2. DECISION SUMMARY

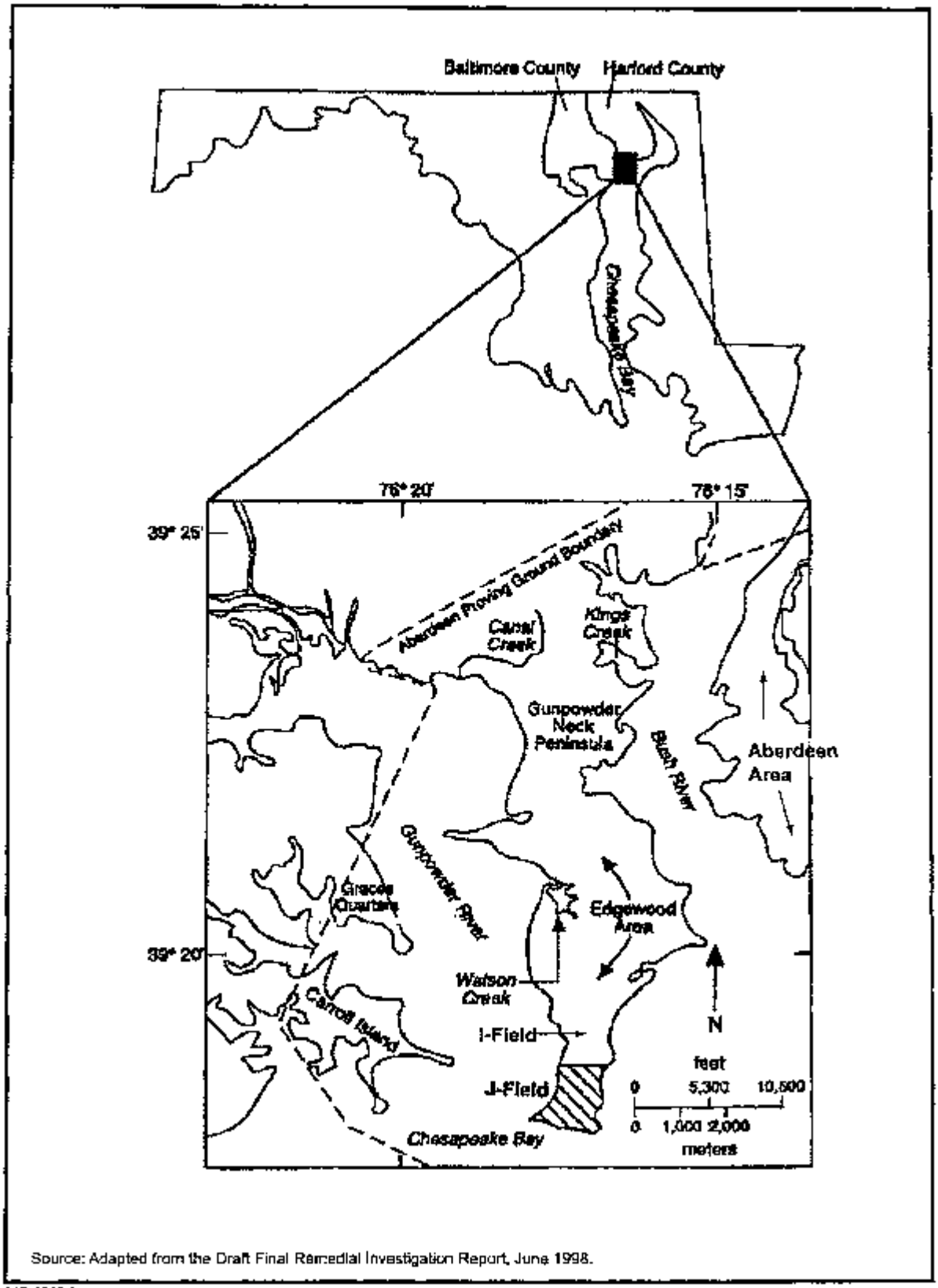
2.1 SITE NAME, LOCATION, AND DESCRIPTION

APG is a 72,000-acre Army installation located in Baltimore and Harford Counties, Maryland, on the western shore of the upper Chesapeake Bay (Figure 3). The installation is bordered to the east and south by the Chesapeake Bay and to the west by Gunpowder Falls State Park, the Crane Power Plant, and residential areas. APG consists of two areas: the Aberdeen Area and the Edgewood Area. Elevations within Aberdeen Proving Ground-Edgewood Area (APG-EA) range from sea level near large rivers to approximately 40 feet above mean sea level at several of the highest locations. APG-EA is listed on the National Priorities List (NPL), which is EPA's list of hazardous substance sites in the United States that are priorities for long-term remedial evaluation and response.

J-Field is located on the southern end of the Gunpowder Neck peninsula of the Edgewood Area (Figure 3). The contaminated groundwater plume in the J-Field Surficial Aquifer is confined to the TBP Area (Figure 2).

There are four primary hydrostratigraphic units at J-Field that are classified in descending order as (1) the Surficial Aquifer, (2) the Confining Unit, (3) the first-Confined Aquifer, and (4) undifferentiated semiconfined to confined aquifer unit (Figure 4). A detailed description of the hydrogeologic framework of J-Field is presented in the initial RI (Hughes, 1995). Previous studies by Otten and Mandle (1984), Drummond and Blomquist (1993), and USACE (1997) detail the regional hydrogeologic framework presented in Figure 4.

Groundwater flow in the Surficial Aquifer is to the east and southwest and discharges to surrounding freshwater marshes. The source of the VOC plume, the former TBPs, resides on a local topographic high. This area contributes to groundwater recharge to the Surficial Aquifer. Seasonal variations in areal recharge result in approximately 3-ft fluctuations of the water table. These fluctuations in groundwater elevations cause short-term shifts in hydraulic gradient and flow direction (Figures 5 and 6) (Phelan, 1998). The groundwater elevation data presented in Figure 6 indicates that there was a cone of depression in the center of the phytoremediation area in August 1999. (Phytoremediation investigations and activities are discussed in Section 2.2.2.) Detailed water level measurements are compiled in monthly status reports (GP, 1999).



Source: Adapted from the Draft Final Remedial Investigation Report, June 1998.

01P-0230-8

FIGURE 3 LOCATION OF J-FIELD IN THE EDGEWOOD AREA AT THE ABERDEEN PROVING GROUND

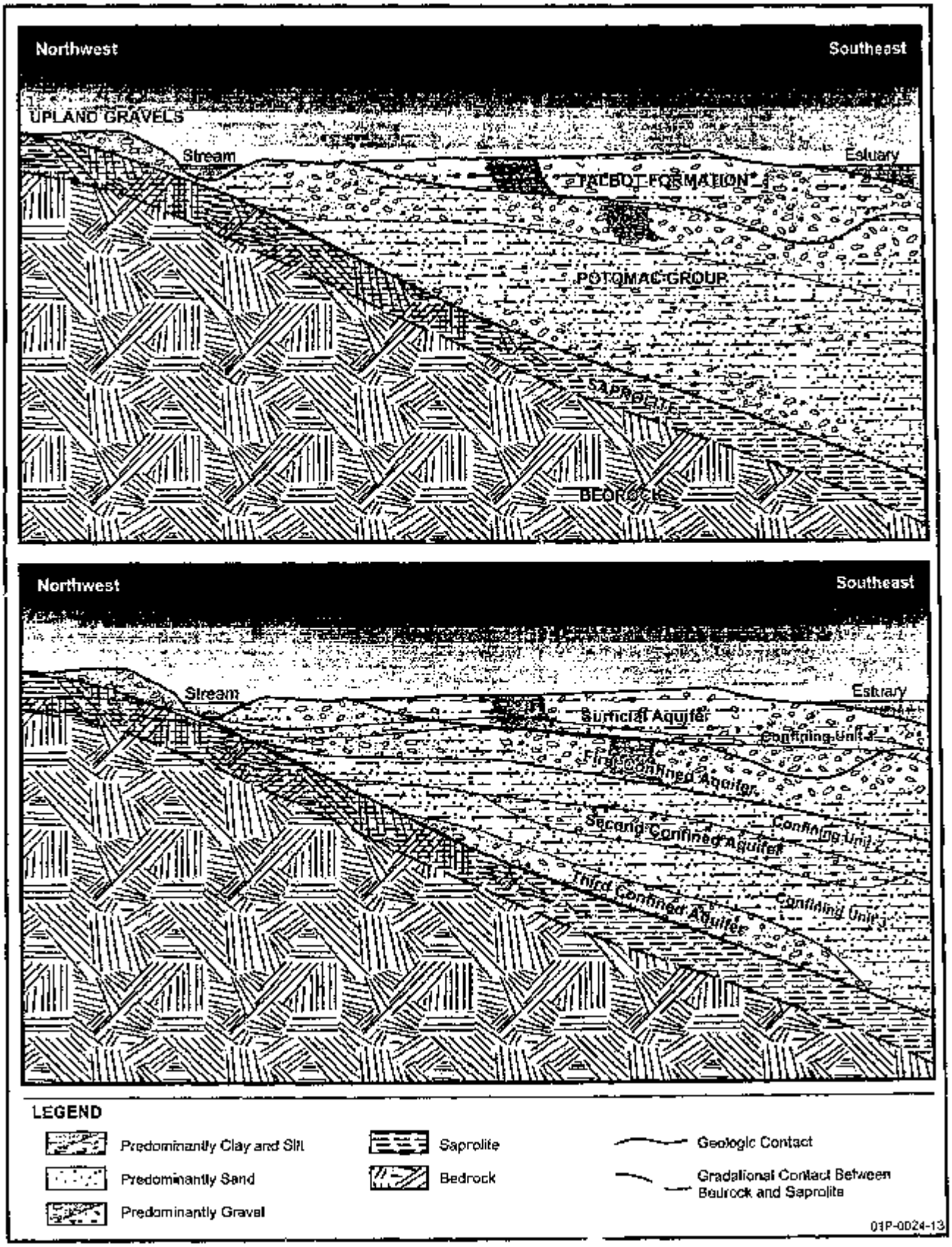
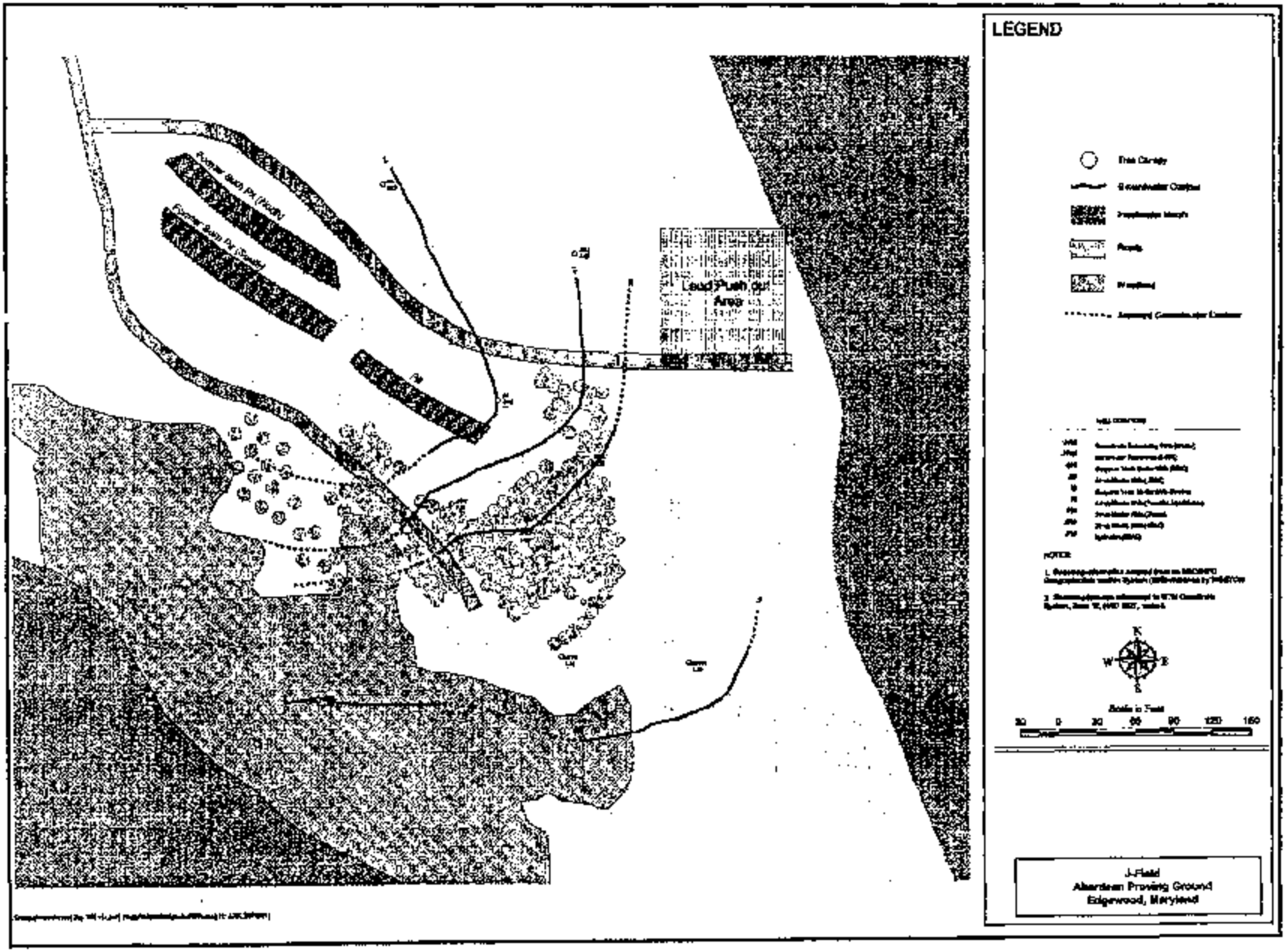
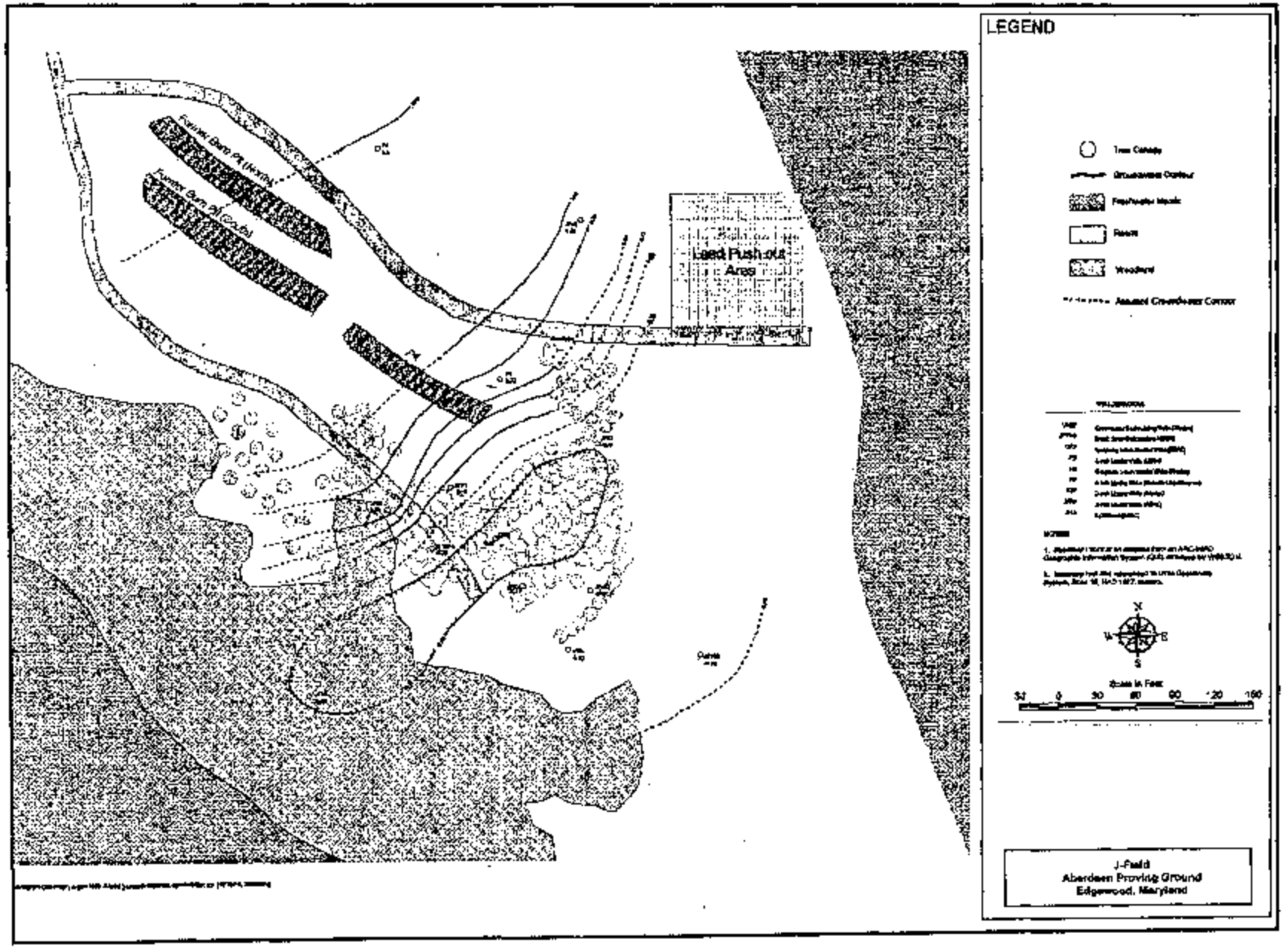


FIGURE 4 GENERALIZED CROSS SECTION OF THE MAJOR STRATIGRAPHIC UNITS UNDERLYING ABERDEEN PROVING GROUND



01P-1162-1

FIGURE 5 GROUNDWATER ELEVATIONS FOR SURFICIAL AQUIFER (MAY 1999)



01P-1182-2

FIGURE 6 GROUNDWATER ELEVATIONS FOR SURFICIAL AQUIFER (AUGUST 1999)

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 History of the J-Field Study Area

APG was established in 1917 as the Ordnance Proving Ground and was designated a formal military post in 1919. Testing of ammunition and materiel and operation of training schools began at APG in 1918. APG-EA has been a center for the development, testing, and manufacture of military-related chemicals since World War I.

The extent of activities at J-Field before World War II is unknown; however, a terrain map from the 1920s-1930s era indicates that some areas of J-Field were cleared at that time. (Argonne,1998) These cleared areas may have been used for test activities. During World War II, J-Field was used for testing High Explosives (HE) and munitions, and for thermal decontamination of chemical munitions. Chemical agents, chemical wastes, and HE were burned or detonated in open pits.

Chemicals historically disposed of at J-Field include nerve agents (such as VX), blister agents, riot control agents, white phosphorous, chlorinated solvents, and drummed chemical wastes generated by research laboratories, process laboratories, pilot plants, and machine and maintenance shops (Argonne, 1998). Between 1946 and 1971, limited testing of chemical agents continued at J-Field. Open-air testing of chemical agents stopped in 1969.

J-Field has had only limited use since 1980. Current activities are conducted in accordance with applicable regulations, including several limited areas at J-Field that remain active for open detonation operations. These areas will be managed and closed under the appropriate environmental program(s) when their use is no longer required for APG's mission.

2.2.2 History of Site Investigations and Enforcement Activities

Several environmental investigations have been conducted at J-Field since the mid-1970s. These studies include: Environmental Contamination Survey, Munitions Disposal Study, RCRA Facility Investigation, Hydrological Assessment, Remedial Investigations, treatability studies, Phytoremediation Demonstration, groundwater plume modeling studies, and other field investigations. These investigations are listed in Table 3 and are described in detail in the FS.

Table 3

J-Field Study Area:
Previous Activities

Activity	Date
Environmental Contamination Survey	1977 - 78
Munitions Disposal Study	1983
RCRA Facility Investigation	1986
Hydrological Assessment, Phase I	1987 - 92
Characterization and Interim Remediation	1992
Hydrological Assessment, Phase II	1992
Sediment Sampling Study	1992
Piezometer Installation and Sampling	1994
Toxic Pits Pilot Remediation Study	1994
Deep Drilling	1995
Remedial Investigation	1991 - 1996
Ecological Risk Assessment	1994 - 96
Aquatic Toxicity Evaluation	1994 - 97
Well Installation and Sampling	1996
Natural Attenuation Study	1997 - 2000
Phytoremediation Demonstration	1997 - present
Honeybee Biomonitoring Program	1997 - present
Groundwater Level Monitoring Study	1998 - present
Hydrogen Release Compound (HRC) Treatability Study	1998 - 1999
Vacuum Vaporizer Well (UVB) Technology Treatability Study	1998 - 1999
Biosolids Investigation	1999
Borehole Geophysical Investigation	1999
Confined Aquifer Wells Abandonment and Replacement	2000
Geochemical Evaluation of Arsenic and Lead Mobility	2000
Time Critical Removal Action	2000
Sampling for Products of Combustion	2000
ROD for TBPs	1996
Shoreline Erosion Controls	September 1998 - April 1999

Completed activities at J-Field are as follows:

Soil Operable Unit

A ROD was signed for the J-Field SOU on 27 September 1996. The September 1996 ROD specified limited removal of contaminated soils from the TBPs, followed by construction of a Protective Soil Blanket (PSB) to prevent ecological exposure. Additional remedial components included shoreline erosion controls along the southern shore of the Gunpowder Neck peninsula to prevent future erosion of contaminated materials into the bay.

The September 1996 ROD implementation was conducted from March 1998 through May 1999. During excavation of the TBPs, UXO and chemical warfare material (CWM) were encountered before excavation to specified cleanup criteria was completed in some areas. However, sufficient material has been removed to permit construction of the PSB as originally described in the September 1996 ROD. The Army has evaluated the potential for migration of remaining contaminants to ecological receptors (Accuscience, 2000). Based upon the results of this evaluation and the issues associated with excavation of the remaining materials, the Army is modifying the remedial action at the TBP from that described in the September 1996 ROD to include work completed to date, followed by construction of the PSB as originally planned. An Explanation of Significant Differences (ESD) has been prepared to amend the September 1996 ROD and construction of the PSB is currently underway.

In accordance with the ESD, excavation of the Northern and Southern TBPs and the Pushout Area will not proceed beyond the materials already excavated. At this point, limited areas of arsenic and lead contamination remain above the intended performance standards. However, the overall depth of the excavation meets the 2-ft minimum depth specified in the September 1996 ROD. The PSB will be constructed in full accordance with the September 1996 ROD, consisting of a minimum of 2 ft of clean backfill and a barrier to burrowing animals. Therefore, the completed system will function as intended and the intent of the original design will be met. Additional excavation would not enhance the protectiveness of the remedy. Additionally, the J-Field Study Area is located in a restricted area of APG. Access to the restricted area is strictly controlled and a wide variety of physical security measures are in place to prevent unauthorized personnel from entering the area. Institutional Controls to be implemented under this ROD will further enhance these restrictions and prevent future human exposure.

Shoreline Erosion Control

Shoreline Erosion Controls (SECs) were installed between September 1998 and April 1999 as specified in the J-Field SOU September 1996 ROD. The J-Field Shoreline stabilization system mitigates shoreline erosion of approximately 3,000 feet of the J-Field shoreline along the Chesapeake Bay from Ricketts Point to the Eastern edge of Big Pond, and thereby prevents migration of hazardous materials. The system consists of on-shore revetments and off-shore breakwaters. Construction details are provided in the Final Technical Report (As-Built) (WESTON, 1999). Following construction of the revetments and breakwaters, the area was vegetated with 32,000 wetland plants (*Spartina patens* and *Scirpus americanus*) to provide support to the beach nourishment system. To maintain some intertidal exchange

along the shoreline as requested by the U.S. Fish and Wildlife Service, a portion of the shoreline remains unprotected.

Work was completed in April 1999. Inspection of the area in the summer of 1999 showed that establishment of the vegetative layer is proceeding. After agency review, the shoreline protection system was deemed appropriate by the Army and compliant with the September 1996 ROD requirements to protect the eroding shoreline from further damage, while protecting valuable habitat. Erosion is being monitored as presented in Post Construction Survey Monitoring Program for J-Field Shoreline Protection Project (WESTON, September 2000b). Surveying events were conducted in July 2000 and July 2001.

Confined Aquifer Corrective Actions

In 1989, a series of monitoring wells was installed in the First Confined Aquifer that underlies J-Field to examine groundwater quality (USGS, 1993). Over the ensuing monitoring periods, sampling of these wells indicated that localized VOC contamination existed in the Confined Aquifer downgradient of the Former TBPs (Argonne, 1998). The source of contamination was uncertain, but was suspected to originate as leakage from the overlying Surficial Aquifer during the 1989 First Confined Aquifer well installation activities. Due to range closures during well installation, the well boreholes were left open and may have provided a path for downward leakage of VOCs. Between 1989 and 1999, sampling of Confined Aquifer water quality indicated that VOC concentrations were declining in several of the wells (JF-41, -51, -61, and -71) to near background levels. In contrast, concentrations in JF-81 continued to increase during this period, suggesting the existence of another possible VOC source to the Confined Aquifer.

Examination of well construction records for the Confined Aquifer wells showed that the wells were not double-cased to seal off the Surficial Aquifer as is the current construction practice for such wells. In 1999, a borehole geophysical study was conducted on the monitor wells screened in the Confined Aquifer to evaluate their integrity and determine if downward leakage through the borehole(s) was possible. Results indicated that grout loss and cracking had occurred in all wells and indicated that JF-81 and JF-82 also suffered from thin bentonite seals above the sand pack. It was determined that these construction problems provided a potential path for VOC contamination in the Surficial Aquifer to migrate through the clay layer to the First Confined Aquifer.

As a result, JF-81 and -82 were abandoned and sealed. Two double-cased downgradient wells (JF-211 and -221) and one replacement well (JF-81R) were installed (WESTON, 2001b). Groundwater sampling was conducted to assess the extent of contamination in the First Confined Aquifer, and borehole geophysical testing was conducted to confirm well construction quality. Results of the sampling indicated that of the three downgradient monitoring wells, only MW-221 indicated detectable VOCs although concentrations were below the respective MCLs. The downward trend of VOCs historically observed in the Confined Aquifer wells was interrupted by elevated concentrations of cis-1,2-DCE and VC in JF-51 and PCE in JF-61. The cause for this unexpected increase in VOCs is not clearly understood, but could be related to several factors including: (1) seasonal variation, (2) variable flow conditions, (3) possible construction issues at other wells(s), and (4) the possibility that the VOCs were temporarily drawn over to JF-51 from

the area around JF-81 during recent well construction. Figure 7 shows results from the October 2000 sampling event. Additional remedial action for the Confined Aquifer will be taken with implementation of this ROD to address these results.

Miscellaneous Actions

In addition to the items listed above, the following investigative or cleanup-related activities have also been conducted at J-Field:

- Geochemical Evaluation of Arsenic and Lead Mobility.
- Biosolids Demonstration in the Pushout Area.
- Drum Removal Action.
- Removal of J-Field Soil/ Debris Piles.

Treatability Studies

The following treatability studies have been conducted at the J-Field Study Area:

- **In-Well Aeration Using Groundwater Circulation Wells –** The Unterdruck-Verdampfer-Brunnen (UVB) system is an in situ groundwater remediation system that develops a vertical groundwater circulation cell around a remediation well. The groundwater circulation cell transports volatile and semivolatile contaminants in soil and groundwater to the well where they are removed. Two UVB wells with different configurations were installed and tested at the TBP area. It was determined that low groundwater flow velocities and low permeabilities at the site limit the effectiveness of the UVB system.

- **Enhanced Biodegradation Using Hydrogen Release Compound (HRC) –** HRC involves adding a chemical compound to the groundwater to enhance natural anaerobic biodegradation processes. The HRC was injected immediately upgradient of monitoring well JFP-5 at 10 locations, forming a semicircle. Monitoring was conducted for approximately 6 months following injection. It was determined that mass removal by HRC is limited by the velocity of groundwater flowing through the HRC injection points. Since the groundwater velocity is slow, mass removal is not significant.

- **Monitored Natural Attenuation (MNA) –** The term "Monitored Natural Attenuation" is defined as the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site clean-up approach) to achieve site-specific remedial objectives within a time-frame that is reasonable compared to that offered by other, more active, methods. The effectiveness of natural attenuation is determined by the contaminant degradation rate. The faster the degradation rate, the higher the rate of

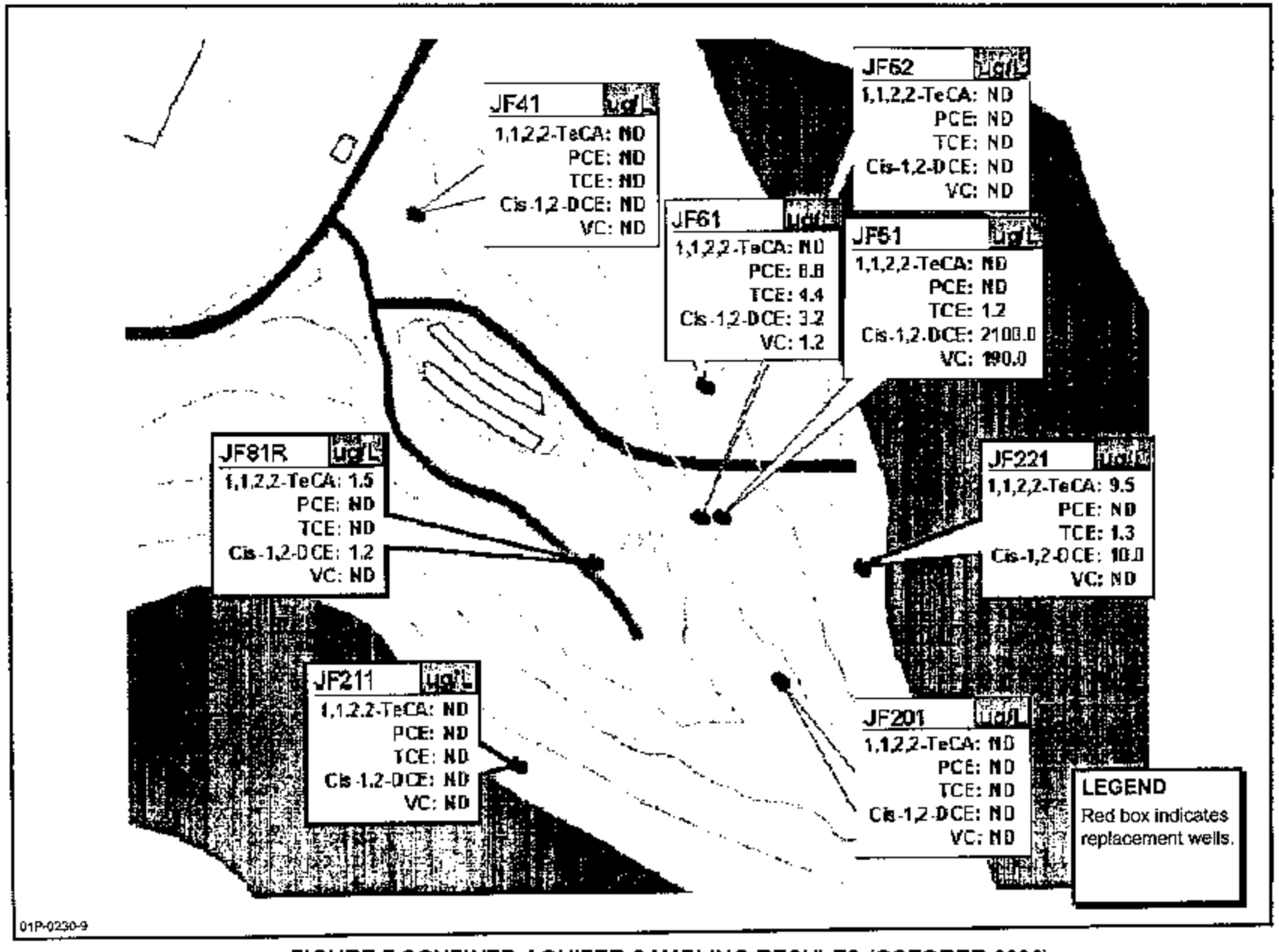


FIGURE 7 CONFINED AQUIFER SAMPLING RESULTS (OCTOBER 2000)

natural attenuation will be. MNA investigations at J-Field have been conducted over the past 5 years. These studies have included sampling of the Surficial Aquifer in the TBP area as well as sampling from a series of piezometers extending out into and below the East Marsh. Results of the initial study indicated that natural attenuation is proceeding efficiently in the East Marsh area. Additional studies have been conducted to further define the effectiveness of natural attenuation in the Surficial Aquifer (Argonne, 2000). These studies included additional sampling in the upland and East Marsh areas as well as sampling along a new transect into the South Marsh. The results of these studies confirm previous conclusions regarding natural attenuation, and demonstrate similar natural attenuation activity in the sediments below the South Marsh. These studies continue to show that, overall, natural attenuation processes are highly effective in the dissolved portion of the groundwater contaminant plume at the site.

Phytoremediation – Phytoremediation is a technology that uses plants and their associated rhizospheric microorganisms to remove, degrade, or contain chemical contaminants located in the soil, sediment, groundwater, surface water, or atmosphere. Over 200 trees (primarily hybrid poplars) were planted in the TBP area between 1997 and 1999. Based on data collected to date, phytoremediation appears to contribute to the removal of VOCs from groundwater.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Draft J-Field Surficial Aquifer Feasibility Study was issued in February 2000. The Proposed Plan was finalized and released to the public on March 9, 2001, initiating a 45-day comment period. These documents, which are included in the Administrative Record for the site, have been made available to the public at the Harford County Public Library (Aberdeen and Edgewood branches) and at the Miller Library at Washington College in Chestertown, Maryland. The notice of availability of the Proposed Plan was published in several local newspapers in Harford, Baltimore, Kent, and Cecil Counties. Public meetings were held at the Edgewood Senior Center on March 20, 2001, and at the Chestertown Middle School Media Center on March 22, 2001, to inform the public of the preferred alternative and to seek public comments. At these meetings, the Army presented the preferred alternative. A representative from MDE attended the 20 March 2001 meeting, but did not supply a formal statement at that time. EPA provided an official statement in support of the Proposed Plan at both Community Meetings. The statement is included in the meeting transcripts, which are also included in the Administrative Record for the site. Responses to comments received during the 45-day comment period are included in the Responsiveness Summary (see Section 3 of this document).

2.4 SCOPE AND ROLE OF ACTION

In accordance with CERCLA, a Feasibility Study (FS) was conducted for the J-Field Surficial Aquifer to identify and evaluate long-term remedial actions for the mass removal of VOCs from the J-Field Surficial Aquifer. The FS was

conducted in accordance with the CERCLA Remedial Investigation/Feasibility Study (RI/FS) Guidance. Investigative activities, which were conducted before and after the FS, are listed in Table 3 of this ROD. A LUCIP will be developed and submitted to EPA within 6 months of ROD signature for review and agreement. The LUCIP will include restriction of Surficial Aquifer groundwater use, and restriction of the use of untreated upper Confined Aquifer groundwater unless it meets all applicable standards and criteria. The LUCIP will clearly identify the Army authority responsible for implementation, monitoring, reporting, and enforcement of the institutional controls.

As shown in Table 1, the White Phosphorous Burning Pit is an active unit and Robins Point Demolition Ground is an active RCRA Interim Status Unit. Therefore, these areas are not covered in this ROD. The locations of these units are depicted in Figure 1.

The HHRA identified COPCs in the case of hypothetical future residential use scenarios as discussed below.

The ecological risk assessment indicated that there are currently no significant ecological risks associated with discharge of the Surficial Aquifer groundwater to the freshwater marsh. The ecological risk assessment also indicated that there is future potential for ecologic effects in the freshwater marsh.

The selected remedy under this ROD will represent the best balance of required and preferred features, as defined by CERCLA guidance and the NCP.

2.5 SUMMARY OF SITE CHARACTERISTICS

The area near the northern and southern TBPs serves as a local groundwater recharge area for the Surficial Aquifer. Groundwater generally flows out from the recharge area, primarily toward the east and southwest. This groundwater flow pattern is reflected in the chemical distribution of total VOCs in the groundwater, as evidenced in Figure 2. The J-Field Surficial Aquifer is primarily contaminated with chlorinated ethanes and ethenes. The wastes that produced the VOC plume(s) were disposed in the former TBPs between the late 1940s and 1970s (Yuen et al., 1997). The amount and exact point of release of VOCs released to the subsurface are not documented.

As shown in Figure 2, the main VOC plume at J-Field appears to be bilobate and extends approximately 270 feet toward the southwest and approximately 360 feet to the east from the TBPs. The lobes are approximately 140 to 160 feet wide. Based on concentrations of VOCs in well JF-173, which is screened in the lower 5 feet of the Surficial Aquifer, and to a lesser extent on concentrations of VOCs in the eastern well nests, groundwater contamination is present vertically throughout the Surficial Aquifer. A significant proportion of VOC mass exists in the upper 20 feet of the Surficial Aquifer as evidenced by the vertical location of the highest contaminated wells (JF-83, JFP-2, and GP-35). The VOC plume has reached the marsh areas on both the East and South sides of the TBP area and undergoes significant biodegradation in the marsh before discharging to surface water (Yuen et al, 1998; Yuen et al, 2001 DRAFT). Surface water sampling, which has been performed since 1993, shows decreasing concentrations through

time of all VOCs, except VC. The 1,1,2,2-TeCA concentrations in the East Marsh decreased more than an order of magnitude between 1994 and 1997, and 1,1,2,2-TeCA was not detected in surface water samples in the South Marsh in 1999 (Yuen et al, 1998; Yuen et al, 2001 DRAFT). Overall, groundwater concentrations decrease at least three orders of magnitude in the 270 to 360 feet that the VOC plume has migrated.

The Surficial Aquifer is primarily contaminated with chlorinated ethanes and ethenes. 1,1,2,2-TeCA, TCA, TCE, 1,2-DCE, PCE, and VC have been measured at concentrations exceeding 100 mg/L (100,000 µg/L) in the Surficial Aquifer. The highest concentrations of VOCs in groundwater are located below the southernmost TBP. In 1999, a maximum concentration of 390 mg/L of 1,1,2,2-TeCA was detected in piezometer GP-35. Maximum concentrations of 110 mg/L of DCE, 93 mg/L of TCE, 11 mg/L of PCE, 7.1 mg/L of TCA, and 4.2 mg/L of VC have been detected in groundwater. Data collected during phytoremediation field investigation efforts in July 2001 is included in Attachment B of this ROD. During this sampling event, VOC concentrations higher than historical concentrations were found in a number of sampling locations. Groundwater concentrations in exceedance of the reported solubility of 1,1,2,2-TeCA were reported for two temporary Geoprobe wells. Also, apparent free phase DNAPL was found in the laboratory sample collected from temporary Geoprobe well GP-53. Data from the July 2001 sampling event are pending validation. Based on historical groundwater data and the observed free phase DNAPL, residual DNAPL likely exists and continues to contribute VOC mass to the dissolved-phase plume. Analyses of these historical data were conducted to assess the likely presence and extent of residual DNAPL and are presented in the TI Evaluation.

Persistent contaminant sources are most commonly attributed to chlorinated solvents lingering as mobile, free phase NAPLs (NAPLs that occur at sufficiently high saturations to drain under the influence of gravity into a well) and immobile, residual phase NAPLs (NAPLs occurring at immobile, residual saturations that are unable to drain into a well by gravity). Through time, groundwater flows through the NAPL source zones and the more soluble constituents partition to the aqueous phase. These contaminant source zones persist for long periods of time due to the slow processes that degrade the NAPL zones (dissolution, volatilization, degradation) and continue to function as a source of groundwater contamination.

Residual DNAPL remediation has been shown to be technically impracticable at the J-Field Study Area (WESTON, 2001c). At sites where subsurface conditions permit the removal of some mobile NAPL, some decrease in the time required to remediate the dissolved-phase plume may be achievable.

Nevertheless, implementing any type of removal, treatment, or containment of NAPLs is complicated by the complex subsurface conditions at J-Field. Many of the technologies designed to remediate DNAPL are severely limited by the heterogeneities and UXO identified at J-Field. Before DNAPL remediation, even at the isolated area where it was observed, a field investigation is required to define the subsurface heterogeneities and to estimate the 3-D distribution of mobile and residual DNAPL. The field investigation will consist of using direct push technology in an effort to map the surface of the potential DNAPL bearing formation so that the recovery well can be placed in a localized low point

for most effective recovery. A plan for recovering free phase DNAPL from the J-Field Surficial Aquifer will be submitted to EPA within 3 months of signature of the J-Field Study Area ROD.

2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Several limited areas at J-Field remain active for open detonation. These areas will be managed and closed in coordination with environmental regulators under the appropriate environmental program(s) when their use is no longer required for APG's mission.

The groundwater from the J-Field Surficial Aquifer is not being used and will not be used for drinking water in the future. Access to J-Field is restricted and the Army intends to use the area only for military industrial purposes. Institutional Controls, as described in this ROD, will further restrict usage.

2.7 SUMMARY OF SITE RISKS

The Human Health Risk Assessment included in the J-Field RI evaluated human health risks due to groundwater for several hypothetical future residential use scenarios. It was determined that the potential cumulative risks associated with hypothetical child and adult resident exposures to groundwater at J-Field were well above EPA's acceptable risk range for health protectiveness at CERCLA sites. The study also indicated that noncarcinogenic effects could occur if persons were exposed. The predominant VOCs associated with high cancer risks and noncancer hazards in groundwater included 1,2-DCA; 1,1-DCE; 1,2-DCE (total); 1,1,2,2-TeCA; PCE,1,1,2-TCA; TCE; and VC. A complete list of contaminants of concern and the relevant regulatory criteria are presented in Table 4. Inorganic constituents which exceed MCLs and non-zero MCLGs are found, with one exception, to be co-located with the VOC plume.

The ecological risk assessment indicated that there are currently no significant ecological risks associated with discharge of Surficial Aquifer groundwater to the freshwater marsh. The ecological risk assessment also indicated that there is future potential for ecologic effects in the freshwater marsh. A list of surface water sampling results from the marsh and the applicable federal and state Ambient Water Quality Criteria (AWQC) are shown in Table 5. Only detected contaminants with AWQC values are presented.

2.8 REMEDIATION OF THE J-FIELD SURFICIAL AQUIFER

Groundwater contamination exists in the J-Field Surficial Aquifer. With respect to remediating this site, the Army focused on the risk of human exposure at the J-Field Study Area. Remedial actions at this site may be warranted to reduce the contaminant mass in the plume to meet ARARs (except as waived by the TI Waiver) and to eliminate exposure to the groundwater. The J-Field Surficial Aquifer FS identified and analyzed several possible remedial

Table 4

Comparison of Maximum Detected Concentrations of Contaminants to Regulatory Criteria

Analyte	J-Field Maximum Detected Concentration (µg/l)	Federal MCLs[a] (µg/l)	Federal MCLGs[b] (µg/l)	Maryland MCLs[c] (µg/l)	EPA Region 3 RBCs[d]
Volatile Organic Compounds (VOCs) (µg/L)					
Acetone	130	–	–	–	610
Benzene	77	5	0	5	0.36
Carbon disulfide	16	–	–	–	1,000
Carbon tetrachloride	6	5	0	5	0.16
Chlorobenzene	980	100	–	100	110
Chloroform	62	–	–	–	0.15
1,2-Dichlorobenzene	4	–	–	–	64
1,4-Dichlorobenzene	2	–	–	–	0.47
1,2-Dichloroethane	211	5	0	5	0.12
1,1-Dichloroethene	150	7	7	7	0.044
cis-1,2-Dichloroethene	81,000	70	70	70	61
trans-1,2-Dichloroethene	29,000	100	100	100	120
1,2-Dichloroethene, total	110,000	–	–	–	55
Ethylbenzene	52	700	700	700	1,300
Hexachlorobutadiene	2	–	–	–	0.86
Hexachloroethane	9	–	–	–	4.8
Methylene chloride	1,000	–	–	–	4.1
1,1,1,2-Tetrachloroethane	140	–	–	–	0.41
1,1,2,2-Tetrachloroethane	390,000	–	–	–	0.053
Tetrachloroethene	11,000	5	0	5	1.1
Toluene	19	1,000	1,000	1,000	750
1,2,4-Trichlorobenzene	5	70	70	70	190
1,1,2-Trichloroethane	7,100	5	3	5	0.19
Trichloroethene	93,000	5	0	5	1.6
Vinyl chloride	4,200	2	–	2	0.019
Xylenes, total	163	10,000	10,000	10,000	12,000
Dissolved Metals (µg/L)					
Mercury	0.95	2	2	2	–
Silver	1.6	–	–	–	180
Aluminum	14,400	–	–	–	37,000
Arsenic	78.6	50	–	50	0.045
Barium	820	2,000	2,000	2,000	2,600

Table 4

Comparison of Maximum Detected Concentrations of Contaminants

to Regulatory Criteria

(Continued)

Analyte	J-Field Maximum Detected Concentration (µg/l)	Federal MCLs[a] (µg/l)	Federal MCLGs [b] (µg/l)	Maryland MCLs[c] (µg/l)	EPA Region 3 RBCs[d]
Beryllium	2.7	4	4	4	73
Cadmium	33.1	5	5	5	18 (water) 37 (food)
Cobalt	43.4	–	–	–	2,200
Chromium	578	100	100	100	55,000 (Cr^{+3}) 110 (Cr^{+6})
Copper	2.62	–	1,300	–	1,500
Iron	196,000	–	–	–	11,000
Manganese	2,580	–	–	–	5,100
Nickel	2,190	–	–	100	730
Lead	124	–	0	50	–
Antimony	19	6	6	6	15
Selenium	54	50	50	50	180
Thallium	5.0	2	0.5	2	2.6
Vanadium	72	–	–	–	260
Zinc	1,880	–	–	–	11,000
Cyanide (free)	50.6	200	200	200	730
Nitrate (as nitrogen)	12,000	10,000	10,000	10,000	58,000

[a] Federal Maximum Contaminant Levels. Source: *National Primary Drinking Water Regulations*, 40 CFR 141.61, 40 CFR 141.62.

[b] Federal Maximum Contaminant Level Goals: Source: *National Primary Drinking Water Regulations*, 40 CFR 141.50, 40 CFR 141.51.

[c] State of Maryland Maximum Contaminant Levels in Drinking Water. Source: COMAR 26.04.01.

[d] EPA Region III Risk-Based Concentrations for Tap Water. Source: EPA Region III RBC table of 12 April 1999.

Table 5

Surface Water Detentions and Ambient Water Quality Criteria

Analyte	Maximum Detected Concentration[1] (ug/L)	National Recommended Water Quality Criteria for Freshwater Aquatic Life		MD Criteria for Ambient Surface Waters	
		Maximum Concentration Criteria (ug/L)	Continuous Concentration Criteria (ug/L)	Acute (ug/L)	Chronic (ug/L)
Arsenic	3.8	340	150	340	150
Copper	18	13	9	13	9
Iron	181100	–	1000	–	–
Lead	20	65	2.5	65	2.5
Zinc	782	120	120	120	120

[1] As reported in J-Field RI.

- Indicates no criteria.

actions. The following six remedial alternatives were developed in the FS to address the contaminated plume in the J-Field Surficial Aquifer:

- Alternative 1 No Action (required by CERCLA to be considered for comparison reasons).
- Alternative 2 Institutional Controls.
- Alternative 3 Phytoremediation with Institutional Controls.
- Alternative 4 Monitored Natural Attenuation (MNA) with Institutional Controls and Phytoremediation.
- Alternative 5 Integrated Remedial System: In Situ Source Area Treatment Using Groundwater Circulation Wells (GCW), MNA, and Phytoremediation.
- Alternative 6 Integrated Remedial System: Source Area Treatment Using Groundwater Pumping, Transport, and Off-Site Treatment of Groundwater, MNA, and Phytoremediation.

Estimated costs for all the alternatives were calculated for 30 years for consistency and comparison purposes. The costs presented in this ROD for these six alternatives are found in the FS Addendum available in the Administrative Record.

2.8.1 Description of the Alternatives

2.8.1.1 Alternative 1: No Action

CERCLA and the NCP require that the No Action alternative be evaluated at every CERCLA site to establish a baseline for comparison. In some cases, No Action may be found to be the appropriate alternative for implementation. This alternative as presented in the J-Field Surficial Aquifer FS includes the following components:

- No active remedial activities would take place under the No Action alternative.
- As required under CERCLA, because hazardous substances will remain on the site, the site would be reviewed after 5 years to reassess site conditions. These CERCLA reviews are included in this and every other alternative in this ROD. They will be conducted every 5 years until the action is completed. Costs associated with this review are not included in any of the alternatives in this document.

Cost Summary

Alternative 1

Capital Cost	$0
Total Present Worth Costs (30 years)	$0

2.8.1.2 Alternative 2: Institutional Controls

This alternative as presented in the J-Field Surficial Aquifer FS includes the following components:

- CERCLA 5-Year Reviews (costs not included).
- Prohibition of untreated groundwater use in the Surficial and Confined Aquifers in order to prevent exposure to the contaminants found in groundwater.
- Prohibition of unauthorized excavation and well installation at the site.
- Posting of at least 2 signs stating site restrictions / prohibitions (maintained for 30 years).
- Incorporation of all site restrictions / prohibitions into APG's GIS, which is used in the development of APG's Real Property Master Plan.
- Inclusion of all site restrictions / prohibitions, a discussion of the NPL status of the site, and a description of the chemical profile and the potential risks associated with the groundwater in any real property or real estate documents necessary for the transfer of ownership from the Army (in the unlikely event that the Army transfers this property). This will ensure that any future property transfers recognize and maintain necessary institutional controls.
- Long-term groundwater monitoring.

Cost Summary
Alternative 2

Capital Cost	$18,000
Operations and Maintenance (O&M) Costs (Present Worth)	$28,000
Total Present Worth Costs (30 years)	$46,000

2.8.1.3 Alternative 3: Phytoremediation with Institutional Controls

This alternative as presented in the J-Field Surficial Aquifer FS includes the following components:

- CERCLA 5-Year Reviews (costs not included).
- Institutional controls as described in Alternative 2.
- Periodic sampling and analysis of groundwater, periodic measurement of groundwater elevation, and periodic monitoring of tree sap flow.
- Periodic sampling and monitoring of phytoremediation trees, and planting of new trees to replace damaged or dead ones.
- Maintenance of trees as needed, such as pruning trees during their growing season.

Cost Summary
Alternative 3

Capital Cost: Institutional Controls	$18,000
O&M Costs: Institutional Controls (Present Worth)	$28,000
O&M Costs: Phytoremediation (Present Worth)	$953,000
Total Present Worth Costs (30 years)	$999,000

2.8.1.4 Alternative 4: MNA with Institutional Controls and Phytoremediation

The Monitored Natural Attenuation (MNA) alternative as presented in the J-Field Surficial Aquifer FS involves the following components:

- CERCLA 5-Year Reviews (cost not included).
- Institutional controls as described in Alternative 2.
- Continuation of the phytoremediation demonstration as described in Alternative 3.
- Quarterly groundwater sampling during the first 4 years to help confirm that the plume is stable, or determine the direction of movement if it is migrating, and to establish a baseline for MNA performance verification. After the first 4 years, annual sampling would be conducted.

Cost Summary
Alternative 4

Capital Cost: Institutional Controls	$18,000
O&M Costs: Institutional Controls (Present Worth)	$28,000
O&M Costs: Phytoremediation (Present Worth)	$953,000
O&M Costs: MNA (Present Worth)	$779,000
Total Present Worth Costs (30 years)	$1,778,000

2.8.1.5 Alternative 5: Integrated Remedial System: In Situ Source Area Treatment Using GCW, MNA, and Phytoremediation

This alternative as presented in the J-Field Surficial Aquifer FS includes the following components:

- CERCLA 5-Year Reviews (costs not included).
- Institutional controls as in Alternative 2.
- Continuation of phytoremediation demonstration as described in Alternative 3.
- Continuation of MNA demonstration as described in Alternative 4.
- Installation of four Groundwater Circulation Wells.
- Periodic monitoring of groundwater.
- Periodic well maintenance as needed, including check for proper performance of equipment, replacement of carbon canisters, periodic well redevelopment, and periodic removal of deposits from well screens.

Cost Summary
Alternative 5

Capital Cost: Institutional Controls	$18,000
Capital Cost: GCW	$970,000
O&M Costs: Institutional Controls (Present Worth)	$28,000
O&M Costs: Phytoremediation (Present Worth)	$953,000
O&M Costs: MNA (Present Worth)	$779,000
O&M Costs: GCW (Present Worth)	$2,413,000
Total Present Worth Costs (30 years)	$5,161,000

2.8.1.6 Alternative 6: Integrated Remedial System: Source Area Treatment Using Groundwater Extraction, Transport and Off-site Treatment of Groundwater, MNA, and Phytoremediation

This alternative as presented in the J-Field Surficial Aquifer FS includes two options, depending on the treatment location. Option A involves treatment of groundwater at the Old O-Field treatment plant at APG, and Option B involves treatment of groundwater at an off-site commercial treatment facility. This alternative includes the following components:

- CERCLA 5-Year Reviews (costs not included).
- Institutional controls as described in Alternative 2.
- Continuation of phytoremediation demonstration as described in Alternative 3.
- Continuation of MNA demonstration as described in Alternative 4.
- Installation of four groundwater extraction wells.
- Installation of groundwater pumping systems on four wells.
- Installation of a temporary 10,000-gal. tank (to hold approximately 3 to 4 daysr volume of recovered groundwater at a total recovery rate of 2 gallons per minute [gpm] from all wells) to store extracted groundwater.
- Periodic trucking of groundwater to the Old O-Field treatment plant (Option A) or to an off-site commercial treatment plant for treatment and discharge (Option B).

Cost Summary
Alternative 6

Capital Cost: Institutional Controls		$18,000
Capital Cost: GW Extraction Wells		$174,000
O&M Costs: Institutional Controls (Present Worth)		$28,000
O&M Costs: Phytoremediation (Present Worth)		$953,000
O&M Costs: MNA (Present Worth)		$779,000
O&M Costs: GW Extraction Wells		
	Option A	$4,334,000
	Option B	$16,434,000
Total Present Worth Costs (30 years)		
	Option A	$6,286,000
	Option B	$18,386,000

2.8.1.7 Alternative Remedial Strategy

As part of the TI Evaluation, an ARS was developed in order to protect human health and the environment from risks associated with hazardous substances at the J-Field Study Area. This ARS includes establishing Institutional Controls, continuation of phytoremediation, monitoring biodegradation processes, abandonment and replacement of Confined Aquifer well JF-51, possible addition of a supplement to the replacement well for JF-51 to foster degradation of the isolated contamination at JF-51 in the Confined Aquifer, continued monitoring of the Confined Aquifer, and collection of mobile DNAPL at the location where it was observed in the July 2001 sampling event. This action will consist of the following components:

- CERCLA 5-Year Review.
- Restriction of Surficial Aquifer groundwater use, and the use of untreated upper Confined Aquifer groundwater unless it meets all applicable standards and criteria, in order to prevent exposure risks associated with contaminated groundwater.
- Prohibition of unauthorized excavation and well installation at the site.
- Provisions for implementation, monitoring, reporting, and enforcement of institutional controls will be specified in the LUCIP.
- Planting additional trees over a minimum of a 1-acre area to further extend the phytoremediation zone.
- Periodic sampling, monitoring, and maintenance of phytoremediation trees, which may include measurements of sap flow, tree tissue, and/or other sampling, and planting of new trees as needed to replace damaged or dead ones. Following planting, the health of the trees would be assessed periodically as the trees become established on the site. Fertilizer and soil amendments may continue to be required, and it may be necessary to prune the trees during their growing season.
- Groundwater sampling for COPCs and monitoring of attenuation and biodegradation parameters to help determine whether the plume is stable or migrating, and the direction of migration of the plume.
- Abandonment and replacement of Confined Aquifer Well JF-51.
- Implementation of free phase DNAPL recovery in the localized area where DNAPL was observed, temporary Geoprobe® well GP-53.
- The addition of a supplemental material to foster degradation of the isolated contamination at JF-51 in the Confined Aquifer will be considered in the Remedial Design.

- Monitoring of the Confined Aquifer.
- Monitoring of the freshwater marsh.
- Periodic maintenance inspections of the shoreline area for indications of erosion.

Under the ARS, the requirement to meet MCLs and non-zero MCLGs within the TI Zone in the Surficial Aquifer will be waived by EPA due to the presence of DNAPL. Components other than DNAPL are also being waived because the presence of DNAPL will make remediation impracticable. The limits of the TI Zone are shown in Figure 8. The specific limits of the TI Zone will be defined by contaminant concentrations.

This alternative differs from the alternatives presented in the FS in that:

- Additional trees will be planted as part of the ARS.
- Phytoremediation sampling was decreased based on previous site experience.
- Confined Aquifer actions (including abandonment and replacement of JF-51) were included and Confined Aquifer wells included in the monitoring strategy.
- Monitoring of the freshwater marsh will be conducted.
- DNAPL recovery due to recent finding of free phase contamination has been added to the ARS.

Costs of the ARS are summarized below.

Cost Summary
Alternative Remedial Strategy

Capital Cost: Institutional Controls	$18,000
Capital Cost: Phytoremediation*	$240,000
Capital Cost: Confined Aquifer Well Abandonment and Replacement	$70,000
Capital Cost: Free Phase DNAPL Recovery System	
O&M Costs: Institutional Controls (Present Worth)	$28,000
O&M Costs: Phytoremediation (Present Worth)	$681,000
O&M Costs: Biodegradation parameters (Present Worth)	$632,000
O&M Costs: Free Phase DNAPL Recovery System (Present Worth)	
Total Present Worth Costs (30 years)	$1,877,000

*Includes cost for UXO clearance

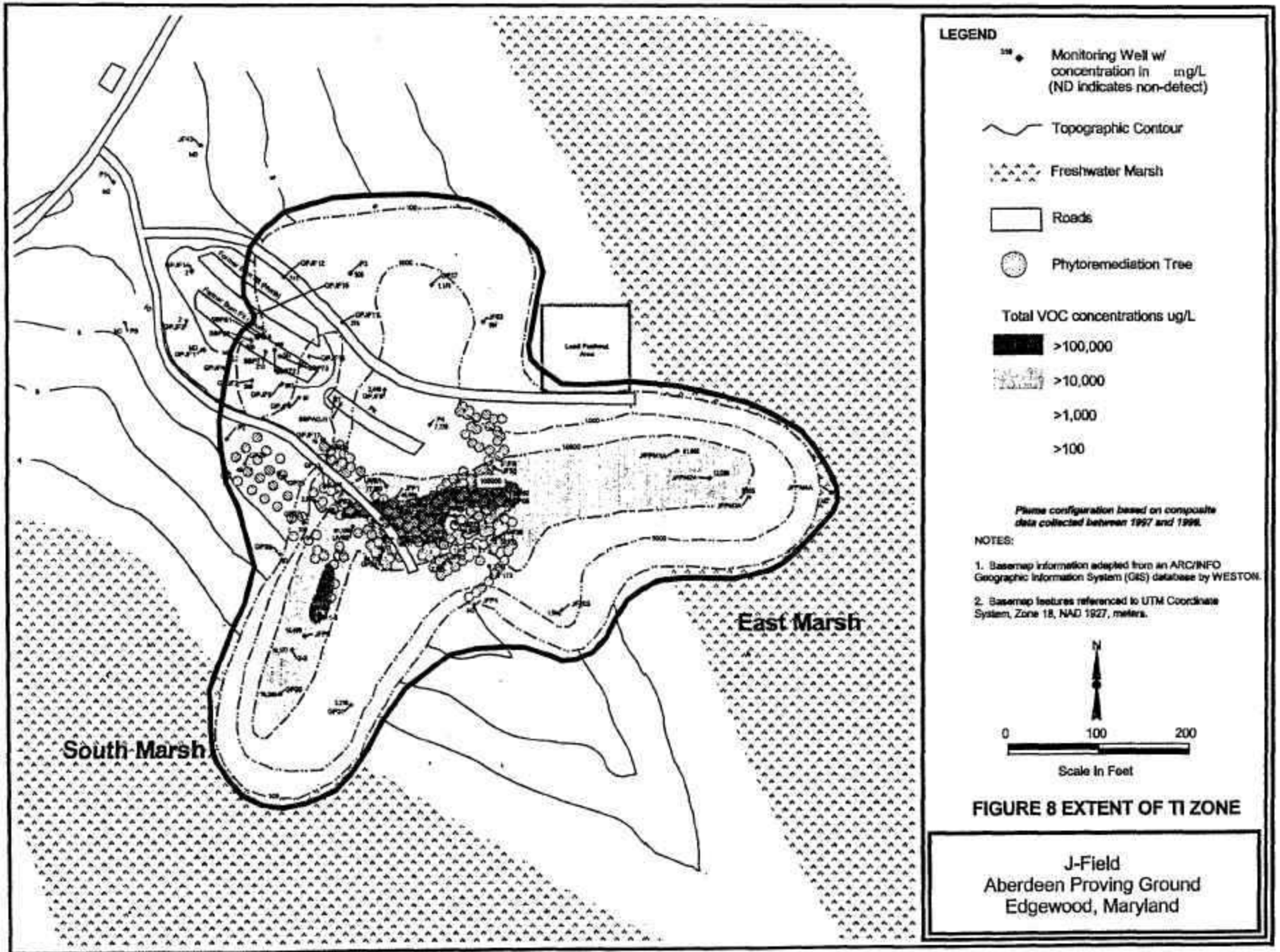


FIGURE 8 EXTENT OF TI ZONE

J-Field
Aberdeen Proving Ground
Edgewood, Maryland

2.8.2 Summary of Comparative Analysis of Alternatives

The remedial alternatives presented in Section 2.8.1 were evaluated in accordance with the regulatory requirements of CERCLA using the nine evaluation criteria specified by EPA as set forth in the NCP (see Table 6). The nine criteria are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria.'The alternative that is ultimately implemented must satisfy the threshold criteria, which are the most important. Primary balancing criteria weigh the major trade-offs among alternatives. Modifying criteria are considered after conclusion of the public comment period. This section summarizes the relative performance of each remedial alternative with respect to these criteria.

2.8.2.1 Threshold Criteria

Overall Protection of Human Health and the Environment. Alternative 1 would not be protective of human health or the environment, and, therefore, will not be considered further in this analysis. Alternative 2 would provide protection to humans by implementation of Institutional Controls. As shown in the Risk Assessment, there are no complete groundwater exposure pathways. Institutional Controls will prevent future exposures.

In the unlikely event that the property is transferred, Institutional Controls will still prevent groundwater use. Long-term monitoring will be included to allow assessment of any changes in site conditions. Alternatives 3 and 4 are passive treatment processes, which may require a longer time to make a significant difference in protection to humans or the environment than some active processes. Alternatives 5 and 6 are focused on source control by treatment or disposal of contaminants. By active treatment of contaminants, these alternatives would provide some increased protection in a relatively short time. However, in the longer term, the performance of Alternative 3 is essentially the same as Alternatives 5 and 6. The ARS would be protective of Human Health and the Environment through the implementation of Institutional Controls as well as ongoing phytoremediation and natural processes.

Compliance with ARARs. CERCLA, as amended, requires that remedial actions at NPL sites comply with or obtain waivers from other State and Federal environmental laws and regulations that may be applicable to the site or that address situations sufficiently similar to those at the site to be considered relevant and appropriate. These ARARs may be: chemical-specific (requirements for managing site contaminants); action-specific (requirements that may apply to specific types of remedial actions under consideration); or location-specific (requirements that are related to the location of the site).

- **Chemical-Specific ARARs**–MCLs and MCLGs established under the Safe Drinking Water Act (SDWA) are applicable to the J-Field Surficial Aquifer. Due to the presence of mobile and residual DNAPL, it has been determined to be technically impracticable to attain the cleanup levels (ARARs) for the individual DNAPL constituents and their degradation products. Additionally, because inorganic contaminants are

Table 6

EPA Evaluation Criteria

Criteria	Description
Threshold Criteria	
Overall Protection of Human Health and the Environment	Addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
Compliance with ARARs	Addresses whether or not a remedy will meet all of the applicable or relevant and appropriate federal and state environmental statutes and requirements or whether grounds exist for invoking a waiver.
Primary Balancing Criteria	
Long-Term Effectiveness and Permanence	Refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.
Reduction of Toxicity, Mobility, and Volume Through Treatment	Refers to the anticipated performance of the treatment technologies a remedy may employ.
Short-Term Effectiveness	Addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until the cleanup goals are achieved.
Implementability	Refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
Cost	Includes the estimated capital and operation and maintenance costs and net present worth costs of each alternative.
Modifying Criteria	
State/Support Agency Acceptance	Indicates whether, based on a review of the RI/FS reports and Proposed Plan, the state/ support agency concurs, opposes, or has no comment on the preferred alternative at the present time.
Community Acceptance	Indicates whether the public agrees with the selected remedy, based on review of public comments received on the Proposed Plan.

Each alternative was evaluated using the nine EPA evaluation criteria described above. Using the results of this evaluation, the Army compared the alternatives and selected the preferred cleanup alternative for the site presented in this Record of Decision.

co-located with the VOC plume, it is also technically impracticable to achieve the ARARs for inorganic constituents. EPA is waiving these ARARs due to technical impracticability. ARARs to be waived are the SDWA MCLs and non-zero MCLGs (40 Code of Federal Regulations [CFR] 141.11-12, 141.50-51, and 141.61-62), which were adopted by the State of Maryland in Code of Maryland Regulations (COMAR) 26.04.01 Regulation of Water Supply, Sewage Disposal, and Solid Waste; and State of Maryland Annotated Code Title 9 – Water Pollution Control (Sections 9-302 and 9-322) as implemented by COMAR 26.08.02.09 Groundwater Quality Standards. RCRA groundwater protection standards referenced in Chapter 40 of Code of Federal Regulations (CFR) Section 264.94 are not applicable to J-Field groundwater since the TBPs are not regulated units. Furthermore, the Federal Facility Agreement provides that a remedial action under CERCLA meets and is equivalent to corrective action under RCRA. Federal and state AWQC are applicable to surface water in the marsh. Chemical-specific ARARs are listed in Table 7.

- **Action-Specific ARARs—Site** work associated with Institutional Controls and monitoring under Alternative 2 would meet action-specific ARARs. Action-specific ARARs associated with Alternatives 3 and 4, such as the planting of new trees and the installation of additional monitoring wells (if required), would be met. These action-specific ARARs would also be met by the ARS. Action-specific ARARs associated with Alternative 5, such as well drilling regulations and VOC emission requirements from the GCW system, would be met. In Alternative 6, action-specific ARARs associated with well drilling, modifications to the Old O-Field treatment plant (if Option A is selected and if modifications are required) would be met. Action-specific ARARs are summarized in Table 8.

- **Location-Specific ARARs—Site** work associated with institutional controls and monitoring under Alternative 2 would meet location- specific ARARs. In Alternatives 3 and 4, activities associated with planting of additional trees would meet applicable location-specific ARARs. Location-specific ARARs would also be met in Alternatives 5 and 6 during installation of wells, and placement of the temporary storage tank and other temporary construction features (Alternative 6) Location-specific ARARs would also be met by the ARS. Location-specific ARARs are summarized in Table 9.

2.8.2.2 Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Future risk could remain due to the movement of the contaminated plume to the marsh. The additional Institutional Controls used in Alternative 2 will prevent exposure of receptors to untreated groundwater by prohibiting its use. Monitoring can be added to Alternative 2 to verify that exposure scenarios do not change. Because limited long-term performance information is available through these technologies, the actual progress can be measured only through the Long Term Monitoring (LTM) program.

Table 7

Chemical-Specific ARARs

Act	Description	Status
Federal Safe Drinking Water Act 40 CFR 141.11-12, 141.61-62	Sets maximum contaminant levels allowable for drinking water.	Relevant and Appropriate
National Recommended Water Quality Criteria published as a guidance in adopting water quality standards pursuant to Section 303(c) of the CWA, 40 CFR 131, revised criteria from 63 FR 67548 of 7 December 1998	Surface water quality standards	Applicable
State of Maryland Regulation of Water Supply, Sewage Disposal, and Solid Waste COMAR 26.04.01	Sets maximum contaminant levels allowable for drinking water.	Relevant and Appropriate
State of Maryland Annotated Code Title 9 - Water Pollution Control as implemented by COMAR 26.08.02.09 Groundwater Quality Standards	State groundwater anti-degradation policy	Relevant and Appropriate
State of Maryland Surface-Water Quality Criteria, COMAR 26.08.02	State surface water quality standards	Applicable

Table 8

Action-Specific ARARs

FEDERAL			
Act	**Action**	**Status**	**Description**
RCRA - Hazardous Waste Management (40 CFR 260 Subtitle C)	Management of hazardous waste generated during construction/ installation and operation of remediation system components	Applicable	RCRA regulates the generation, transport, storage, treatment, and disposal of hazardous waste.
RCRA - Preparedness and Prevention (40 CFR 264.30- 31, Subpart C)	Safety procedures during construction/ installation and operation of remediation system components	Applicable	This regulation outlines requirements for safety equipment and spill control.
RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50-56, Subpart D)	Safety procedures during construction/ installation and operation of remediation system components	Applicable	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc.
RCRA - Closure and Post Closure (40 CFR 264.110-120, Subpart G)	Post remediation monitoring	Relevant and appropriate	This regulation details specific requirements for closure and post-closure of hazardous waste facilities.
Clean Water Act (CWA) - Surface-water quality criteria (CWA Section 303(c), 40 CFR 131)	Discharges to surface waters	Relevant and appropriate	This regulation publishes the National Recommended Water Quality Criteria as guidance in adopting water quality standards.

Table 8

Action-Specific ARARs

(Continued)

FEDERAL (Continued)			
Act	**Action**	**Status**	**Description**
Clean Water Act - Effluent limitations for point source discharge (CWA Section 402,40 CFR 125 and 401)	Discharges to surface waters	Relevant and Appropriate	This regulation establishes National Pollutant Discharge Elimination System (NPDES) program requirements for discharge of treated water to a point source.
National Recommended Water Quality Criteria (40 CFR 131)	Surface water quality	Applicable	This regulation establishes Ambient Water Quality Criteria for surface water bodies.
Clean Air Act - Emission Standards (40 CFR 61)	Emissions from remediation system components	Relevant and Appropriate	This regulation establishes National Emission Standards for Hazardous Air Pollutants (NESHAPs) for owners or operators of sources of hazardous pollutants.
MARYLAND			
COMAR* Subtitle	**Action**	**Status**	**Description**
MDE- Hazardous Waste Management COMAR 26.13	Management of hazardous waste during construction/ installation and operation of remediation system components	Applicable	Regulates the generation, transport, storage, treatment, and disposal of hazardous waste.
Maryland Surface Water Quality Regulations (COMAR 26.08.02)	Discharges to surface waters	Relevant and Appropriate	This regulation establishes Maryland Surface Water Quality Criteria to protect public health or welfare, enhance the quality of water, and protect aquatic resources.
Maryland Air Quality Regulations - (COMAR 26.11.06)	Emissions from construction and operation of remediation system components.	Relevant and Appropriate	This regulation sets general emission standards, prohibitions, and restrictions on emissions generated from installations.

Table 8

Action-Specific ARARs

(Continued)

MARYLAND (Continued)			
COMAR* Subtitle	**Action**	**Status**	**Description**
Maryland Erosion and Sediment Control Regulations (COMAR 23.17.01)	Soil disturbance activities such as monitor well drilling and tree planting	Relevant and Appropriate	This regulation regulates erosion and sediment controls to be implemented during soil disturbance activities.
Maryland Annotated Code Title 3 – Noise Control	Noise control during construction activities	Applicable	Except as otherwise provided by law, MDE adopts environmental noise standards, sound-level limits, and noise control rules and regulations as necessary to protect the public health, the general welfare, and property.

*COMAR = Code of Maryland Regulations.

Table 9

Location-Specific ARARs

FEDERAL			
Act	**Action**	**Status**	**Description**
RCRA - Location of facilities in floodplains (40 CFR 264.18(b))	Construction activities in floodplain	Relevant and Appropriate	This regulation states that a facility be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood.
Fish and Wildlife Coordination Act - Fish and wildlife conservation (16 USC 661 et seq., 40 CFR 6.302, 6(h))	Disturbances to wildlife from remedial activities	Applicable	This regulation states that wildlife conservation be given equal consideration and be coordinated with other aspects of water resource development programs.
Endangered Species Act (16 USC 1531 et seq., 33 CFR 320-330, 40 CFR 6.302, 50 CFR 27, 50 CFR 200, 50 CFR 402.01, .02)	Activities which may affect endangered species from remedial activities	Applicable	This regulation provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. A variety of endangered species have been identify in the EA and may be present at J-Field.
Coastal Zone Management Act (CZMA) (16 USC 1451, et seq.)	Remedial activities within the coastal zone	Relevant and Appropriate	The Coastal Zone Management Act requires a consistency determination and state agreement prior to the issuance or expansion of activities within a state with a federally-approved Coastal Management Program when activities that would occur within, or outside, that states coastal zone will affect land or water uses or natural resources of the states coastal zone.
Natural Resources Article, Subtitle 18, Chesapeake Bay Critical Area Protection Program	Remedial activities within the Chesapeake Bay Critical Area	Relevant and Appropriate	This subtitle establishes a Resource Protection Program for the Chesapeake Bay and its tributaries by fostering more sensitive development activity for certain shoreline areas to minimize damage to water quality and natural habitats and implements the Program on a cooperative basis between the State and affected local governments, with local governments establishing and implementing their programs in a consistent and uniform manner subject to State criteria and oversight.
Executive Order 11988 - Floodplain management	Remedial actions in the floodplain	Applicable	This executive order calls for avoiding long- and short-term impacts to a flood plain due to occupancy or modifications.
Executive Order 11988 - Protection of wetlands	Reduce or eliminate wetlands impact during construction activities	Applicable	This executive order requires federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction.

Table 9

Location-Specific ARARs
(Continued)

FEDERAL (Continued)			
Act	**Action**	**Status**	**Description**
Bald and Golden Eagle Protection Act (16 USC 668 et seq.) of 1940	Eliminate disturbance to Bald Eagle during construction activities	Applicable	Establishes regulations to protect bald and golden eagles. These species have been observed at EA and may be present at J-Field.
Migratory Bird Treaty Act (16 USC 703 et seq.)	Eliminate disturbance to migratory birds during construction activities	Applicable	Establishes regulations to protect migratory birds. Migratory birds may be present at J-Field at certain times of the year.
MARYLAND			
COMAR* Subtitle	**Action**	**Status**	**Description**
Maryland Tidal Wetlands Regulations (COMAR 26.24.01)	Remedial actions in the wetlands areas	Applicable	This regulation sets goals to preserve the tidal wetlands of the State of Maryland, prevent their loss and plunder, and strive for a net resource gain in tidal wetland acreage and function.
The Maryland Environmental Policy Act (Chapter 703 of the Laws of 1973, as codified in Sections 1-301 through 1-305)	Remediation activities which may have sort or long term impacts.	Relevant and Appropriate	This act mandates that state agencies, in balancing economic development and environmental quality, will engage in thoughtful consideration of the environmental effects of their proposed actions.

A reduction in risk can also be expected in Alternative 5. Although GCW systems have proven to be successful at some sites, site conditions as described in the TI Evaluation make its implementation at J-Field inefficient as a means of mass removal. The pump-and-treat or dispose technology used in Alternative 6 is the most reliable method of reducing the risk posed by contaminants. In this alternative, all of the groundwater that enters the well is pumped out completely, instead of recirculating a portion of it back to the aquifer as in Alternative 5. Therefore, the mass removal of contaminants may be more expeditious. Permanent removal of contaminants from groundwater makes the engineering controls used in this alternative adequate and reliable. However, as with Alternative 5, this process will be restricted by the low permeability soils and the presence of residual DNAPL.

Reduction of Toxicity, Mobility, and Volume. In Alternative 2, a verifiable reduction in toxicity, mobility, and volume is not expected in the foreseeable future. In Alternatives 3 and 4 and in the ARS, a reduction in toxicity, mobility, and volume of contaminants is expected over time through biodegradation and/ or abiotic degradation of contaminants. The degree of reduction in toxicity, mobility, and volume of the parent compounds, as well as the toxicity and volume of the degradation products, need to be evaluated through the LTM program. Additionally, in the ARS, removal of free-phase DNAPL would reduce the toxicity, mobility, and volume of contaminants. The extent of this reduction is dependent on the amount of product recovered. In Alternative 5, the mobility of the contaminants would be reduced by removing them from groundwater. The toxicity and volume would be reduced only if the contaminants removed by the treatment system were chemically destroyed during the operations. However, permanent removal of contaminants from groundwater would reduce the overall toxicity and volume of contaminated groundwater at J-Field. In Alternative 6, the mobility of the contaminants would be reduced by the removal of contaminants from groundwater. The toxicity and volume of the contaminants would also be reduced by treatment and/or destruction of contaminants at the Old O-Field treatment plant or at an off-site treatment plant.

Short-Term Effectiveness. Alternative 2 includes minor site activity such as posting signs indicating that the area poses a potential threat to the community or the workers. Risk to site workers from these activities can be easily controlled. There would be minimal additional risk in Alternatives 3 and 4 and in the ARS during planting of trees, well drilling (if any additional monitoring wells are required), and sampling activities. In Alternative 5, workers would be protected from noise, dust, and construction hazards by taking appropriate safety precautions. Air emissions from the GCW system would be controlled in accordance with emission requirements. There would be no significant effect on the community because no one lives or routinely works in the TBP area or in the vicinity of J Field. In Alternative 6, workers would be protected from noise, dust, and construction hazards by taking appropriate safety measures. Precautions would be taken to prevent spillage of groundwater when transferring stored groundwater from the temporary tank to the truck, during the transport process, and when discharging to the Old O-Field or off-site treatment plant.

Implementability. There are no technical or administrative issues associated with the implementation of Alternative 2. Alternatives 3 and 4 can be implemented easily because the only activities associated with these alternatives are planting of additional trees and sampling activities. In Alternative 3 and the ARS, sampling and monitoring activities

can be performed by employing personnel trained in phytoremediation-related work. Implementation of Alternative 5 requires vendor involvement because the GCW process is patented. Installation of GCWs can be performed by local contractors specializing in well installation. Equipment must be ordered in advance to meet schedule requirements. Installation of groundwater pumping wells in Alternative 6 can be performed by local contractors specializing in well installation. All alternatives involving invasive construction activities (Alternatives 2 through 6) would require UXO clearance. Transportation of groundwater can be accomplished using a dedicated truck. If any modifications are needed to the Old O-Field treatment plant, they can be performed using local vendors specializing in water treatment equipment and installation. All alternatives require a TI Waiver for implementation.

Cost. Total present worth costs were estimated for the six alternatives for a period of 30 years. Costs for CERCLA 5-Year reviews were calculated based on one review every 5 years for 30 years. Detailed estimates for capital and O&M costs are included in the FS and the TI Evaluation, which is Appendix C of the FS. A summary of present worth costs for the comparative evaluation of the alternatives as presented in the FS is as follows:

Present-Worth Cost*		
Alternative 1:		$0
Alternative 2:		$46,000
Alternative 3:		$999,000
Alternative 4:		$1,778,000
Alternative 5:		$5,161,000
Alternative 6:	Option A Option B	$6,286,000 $18,386,000
Alternative Remedial Strategy		$1,877,000

*Does not include cost of 5-Year Reviews

2.8.2.3 Modifying Criteria

State/Support Agency Acceptance.

MDE concurs with the Selected Remedy.

Community Acceptance.

Based upon responses received during the Public Comment Period, the public accepts the Selected Remedy.

2.8.3 The Selected Remedy

The ARS as presented in the TI Evaluation is the Selected Remedy since it best satisfies the threshold CERCLA Evaluation Criteria of Overall Protectiveness and Compliance with ARARs that have not been waived. Other criteria are also satisfied and the alternative is cost-effective in comparison with other alternatives. The Selected Remedy consists of establishing Institutional Controls, continuation of phytoremediation, monitoring biodegradation processes, abandonment and replacement of Confined Aquifer well JF-51, possible addition of a supplement to JF-51 to foster degradation of the isolated contamination at JF-51 in the Confined Aquifer, implementation of free phase DNAPL recovery in the localized area surrounding temporary Geoprobe well GP-53, and continued monitoring of the Confined Aquifer.

In the Selected Remedy, the implementation of Institutional Controls would involve prohibiting unauthorized excavation, the restriction of Surficial Aquifer groundwater use, and the use of untreated upper Confined Aquifer groundwater unless it meets all applicable standards and criteria, in order to prevent exposure risks associated with contaminated groundwater. The ongoing phytoremediation demonstration will be continued, including planting of additional trees and maintenance and monitoring for all trees involved in the study. Groundwater will be monitored for contaminants as well as for biodegradation parameters to assess the ongoing natural biodegradation processes which are treating the contaminants. This monitoring will be conducted in accordance with the approved O&M/LTM Plan. CERCLA reviews would be conducted every 5 years. Implementation of free phase DNAPL recovery in the localized area surrounding temporary Geoprobe well GP-53 will be initiated.

The Selected Remedy provides long- and short-term protection to human health and the environment through use restrictions. The adequacy and reliability of the institutional controls for restricting groundwater use is considered high. Because no groundwater will be extracted, the alternative creates no additional risks to the community, workers, or the environment due to the construction of an extraction and treatment system.

The Selected Remedy provides contaminant mass reduction through Phytoremediation and biodegradation processes, thus providing reduction in the toxicity, mobility, and volume of the contaminants.

The Selected Remedy is considered easy to implement Actions to be taken are limited to the prevention of groundwater use to be regulated by the Army; the implementation of a monitoring program for contaminants and for attenuation, biodegradation, and phytoremediation parameters; and planting of additional phytoremediation trees.

Based on the best information available at this time, the preferred alternative will be protective of human health and the environment through site management and will be cost-effective.

Through the environmental program to monitor for contaminants in the Surficial and Confined Aquifers and to monitor for biodegradation and phytoremediation parameters in the Surficial Aquifer, the Army will be able to monitor the effectiveness of the remedy and determine whether adverse changes in risk have occurred at the site.

2.8.4 The Statutory Determinations

The Selected Remedy discussed in Section 2.8.3 satisfies the requirements under Section 121 of CERCLA for protecting human health and the environment, compliance with ARARs (except as waived by the TI Waiver), and cost-effectiveness. The ARS (e.g. phytoremediation and natural processes) is expected to prevent the further migration of the dissolved contaminant plume.

2.8.4.1 Protection of Human Health and the Environment

The Selected Remedy offers mitigation of risks to humans associated with the J-Field Surficial Aquifer through Institutional Controls. Site access restrictions apply to the entire J-Field Study Area. Any adverse short-term effects associated with the implementation of this alternative will be minimized to the maximum extent practicable through the use of protective measures. For example, site workers will utilize all appropriate safety clothing and employ safe work practices.

2.8.4.2 Compliance with ARARs

Chemical-specific, action-specific, and location-specific ARARs are presented in Tables 7, 8, and 9. The Selected Remedy will comply with these ARARs, and with chemical-specific ARARs (except as waived by the TI Waiver).

2.8.4.3 Cost-Effectiveness

The Selected Remedy is less costly than Alternatives 4, 5, and 6. Although the present worth cost of the Selected Remedy is higher than the costs for Alternatives 1, 2, and 3, it does offer some additional benefits.

2.8.4.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

This remedy utilizes phytoremediation, which is an innovative technology for groundwater. This remedy utilizes permanent solutions as currently available to the maximum extent practicable for the site. This action represents the final remedy for the J-Field Study Area, except for limited areas that remain active, and represents the best balance of trade-offs among the alternatives with respect to the nine evaluation criteria.

2.8.4.5 Preference for Treatment as a Principal Element

The preference for treatment as a principal element is not met in the TI Zone. The preference for treatment is met by phytoremediation outside the TI Zone and by remedial actions in the Confined Aquifer.

2.8.4.6 Significant Changes from the Proposed Plan

The following significant changes from the Preferred Alternative in the Proposed Plan are included in this ROD:

- During the July 2001 phytoremediation sampling event, VOC concentrations higher than historical concentrations were found in a number of sampling locations. Groundwater concentrations in exceedance of the reported solubility of 1,1,2,2-TeCA were reported for two temporary Geoprobe wells. Also, apparent free phase DNAPL was found in the laboratory sample collected from temporary Geoprobe well GP-53. Based on historical groundwater data and the observed free phase DNAPL, residual DNAPL likely exists and continues to contribute VOC mass to the dissolved-phase plume. The Selected Remedy includes implementation of free phase DNAPL recovery in the localized area where DNAPL was observed. The capital and O&M costs for the Selected Remedy have been modified to include costs associated with this DNAPL recovery
- ARARs to be waived are the SDWA MCLs and non-zero MCLGs (40 Code of Federal Regulations [CFR] 141.11-12, 141.50-51, and 141.61-62), which were adopted by the State of Maryland in Code of Maryland Regulations (COMAR) 26.04.01 Regulation of Water Supply, Sewage Disposal, and Solid Waste; and State of Maryland Annotated Code Title 9 – Water Pollution Control (Sections 9-302 and 9-322) as implemented by COMAR 26.08.02.09 Groundwater Quality Standards.

2.9 PERFORMANCE STANDARDS

The requirement to meet MCLs and non-zero MCLGs within the portion of the zone defined as the TI Zone in the Surficial Aquifer has been waived by EPA in the J-Field Surficial Aquifer due to the presence of DNAPL. Standards for inorganic contaminants which are co-located with the VOC plume are also being waived. ARARs to be waived are SDWA MCLs and non-zero MCLGs (40 Code of Federal Regulations [CFR] 141.11-12, 141.50-51, and 141.61-62), which were adopted by the State of Maryland in Code of Maryland Regulations (COMAR) 26.04.01 Regulation of Water Supply, Sewage Disposal, and Solid Waste; and State of Maryland Annotated Code Title 9 – Water Pollution Control (sections 9-302 and 9-322) as implemented by COMAR 26.08.02.09 Groundwater Quality Standards. Monitoring of the Surficial Aquifer groundwater within the TI Zone will be conducted to track the progress of the phytoremediation and natural degradation processes and to detect plume migration. Specific details regarding monitoring will be included in the O&M / LTM Plan.

The limits of the TI Zone are shown in Figure 8 and include the entire plume of contamination.

A plan for recovery of free phase DNAPL in the localized area, where DNAPL was observed during phytoremediation sampling in July 2001 (near temporary Geoprobe well GP-53), will be developed within 3 months of ROD signature. A well will be installed in an appropriate location to attempt to intercept the free phase DNAPL material. The well will be bailed manually periodically and any recovered product and/ or water will be containerized

for proper disposal. The specific well location will be determined by preliminary investigations using direct push technology in an effort to map the configuration of the potential DNAPL bearing formation and locate the well in a localized low point for most effective recovery.

ARARs will be achieved in all portions of the Confined Aquifer.

An Operations and Maintenance and Long Term Monitoring (O&M / LTM) Plan will be developed to address the locations, frequency, and analytical parameters for monitoring of the phytoremediation and biodegradation activity, and conditions in the Surficial and Confined Aquifer and the freshwater marsh. The O&M / LTM plan will also specify maintenance procedures for remedy components including maintenance of the phytoremediation trees and the Monitoring well network. The Draft O&M /LTM Plan will be developed within 6 months of ROD signature.

A LUCIP will be developed and submitted to EPA within 6 months of ROD signature for review and agreement. The LUCIP will include restriction of Surficial Aquifer groundwater use, and restriction of the use of untreated upper Confined Aquifer groundwater unless it meets all applicable standards and criteria. The LUCIP will clearly identify the Army authority responsible for implementation, monitoring, reporting, and enforcement of the institutional controls.

CERCLA 5-Year Reviews will be conducted for this site. In addition to the requirements set forth in EPA and DoD guidance documents, the Army will also conduct a technology review for innovative methods of treating the groundwater in the Surficial Aquifer. Periodic inspections of the J-Field shoreline for signs of erosion will be conducted.

3. RESPONSIVENESS SUMMARY

The final component of the ROD is the Responsiveness Summary. The purpose of the Responsiveness Summary is to provide a summary of the public's comments, concerns, and questions about the J-Field Proposed Plan and the Army's responses to these concerns.

The Army held public meetings on March 20 and 22, 2001, to formally present the Proposed Plan and to answer questions and receive comments. The transcripts of these meetings are part of the Administrative Record for the site. During the public comment period, written comments were also received. All comments and concerns summarized below have been considered by the Army and EPA in selecting the cleanup method for the J-Field Surficial Aquifer.

This responsiveness summary is divided into the following sections:

3.1 Overview.

3.2 Background on community involvement.

3.3 Summary of comments received during the public comment period and the Army's responses.

3.4 Comments from March Public Meetings.

3.5 Written Comments Received.

3.1 OVERVIEW

At the time of the public comment period, the Army had endorsed a preferred alternative for the J-Field Surficial Aquifer. The Army proposed implementing institutional controls, continuing the phytoremediation project and planting additional trees, and continuing groundwater sampling and monitoring of the biodegradation process. In addition, the Confined Aquifer will be monitored. The addition of a supplemental material to foster degradation of the isolated contaminants in Confined Aquifer well JF-51 will be considered during Remedial Design. MDE concurs with the selected remedy. The community also agrees with the selected alternative.

3.2 BACKGROUND ON COMMUNITY INVOLVEMENT

The Army has maintained a highly active public involvement and information program throughout the CERCLA process. It is the Army's intent to actively solicit input from the community and to involve the community through the decision making process. Highlights of the community's involvement in the J-Field Proposed Plan and J-Field activities during the last few years follow:

- The Army has kept the Restoration Advisory Board updated on the J-Field Study Area since the Board's creation; prior to that, the Army regularly discussed the J-Field Study Area with the Board's predecessor, the Technical Review Committee. In January 2001, the Army discussed the FS for the Surficial Aquifer

and the alternatives that would be part of the Proposed Plan. The Army also provided the Board members with a copy of the Proposed Plan for their review during the formal public comment period.

- The Army released a Proposed Plan for the J-Field Surficial Aquifer for public comment on March 9, 2001. Copies were available to the public through Administrative Record locations at the Joppa and Aberdeen branches of Harford County Library and Miller Library at Washington College in Kent County, as well as at two information repository locations at the Edgewood Library in Harford County and the Cecilton Library in Cecil County. A copy of the Proposed Plan also was posted on the Installation Restoration Program's Web Site, and the public was invited to comment through the Web Site.

- A 45-day public comment period on the Proposed Plan ran from March 9 to April 23, 2001.

- The Army prepared a press release announcing the availability of the Proposed Plan, the dates of the public comment period, and the date and time of the two public meetings. The Army placed newspaper advertisements announcing the public comment period and meeting in The Aegis, The Avenue, The Cecil Whig, The East County Times, and The Kent County News.

- The Army prepared and published a fact sheet on the Proposed Plan including information on the public meetings. The Army mailed copies of this fact sheet to more than 2,600 citizens and elected officials on its Installation Restoration Program mailing list. The fact sheet included a form which citizens could use to submit their comments.

- On March 20, the Army held a public meeting at the Edgewood Senior Center in Edgewood, Maryland. Representatives of the Army and MDE were present. Army representatives presented information on the site and on the proposed cleanup alternatives. On March 22, the Army held a second public meeting at Chestertown Middle School in Chestertown, Maryland, where information on the Proposed Plan also was presented.

3.3 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

Comments raised during the public comment period on the J-Field Proposed Plan are summarized below. The comments are categorized by source.

COMMENTS FROM QUESTIONNAIRE INCLUDED WITH FACT SHEET

As part of its fact sheet on the Proposed Plan, the Army included a questionnaire that residents could return with their comments. Over 2,600 postage paid questionnaire forms were sent to the community to solicit the public's preferences regarding remedy selection. The Army has received 8 completed forms. The Army believes that the public's overall

comfort with our progress on this site may be reflected in the fact that relatively few forms were returned with comments. The alternatives preferred by individuals returning comment forms were:

Remedial Alternative	Favorable Responses
Alternative No. 1 - Take No Action.	0
Alternative No. 2 - Institutional Controls.	0
Alternative No. 3 - Phytoremediation with Institutional Controls.	0
Alternative No. 4 - Monitored Natural Attenuation with Institutional Controls and Phytoremediation.	1
Alternative No. 5 - Integrated Remedial System: In-Situ Source Area Treatment Using Groundwater Circulation Wells, Monitored Natural Attenuation, and Phytoremediation.	1
Alternative No. 6 - Integrated Remedial System: Source Area Treatment Using Groundwater Pumping, Transport and Treatment of Groundwater, Monitored Natural Attenuation and Phytoremediation.	0
Alternative No. 7 - Alternative Remedial Strategy.	5
Either Alternative No. 4 or Alternative No. 7.	1
Total Responses	8

Written comments included on the forms are summarized below.

Comment No. 1: [Commenter selected Alternative 4 or Alternative 7] "I accept #7 given that the sampling and monitoring occurs on a quarterly basis as described for Alternative 4. It is not clear to me why option #7 will cost less than option #4 – the lower down amount leads me to believe that the sampling may occur less frequently under option 7. If that is the case, I support option 4. I very much approve of the phytoremediation and biodegradation efforts and do not support trying to use this groundwater in any way."

Response No. 1:

The primary differences in cost between Alternative 4 and the Alternative Remedial Strategy (ARS) (Alternative 7) are as follows:

- The biodegradation parameters will initially be monitored semi-annually for the ARS as compared to quarterly for Alternative 4. In both cases, the monitoring frequency will decrease to annually in the fourth year.

Fewer wells will be monitored under the ARS than for Alternative 4. The monitoring locations will still include sites upgradient of the hot spot, at the hot spot, and downgradient from the hot spot. The higher level of activity in Alternative 4 was to support the Monitored Natural Attenuation demonstration, which requires analysis of contaminant trends over time and across the site to document more completely the degradation processes. The Army feels that the monitoring frequencies provided in the ARS are sufficient to ensure that site conditions are closely watched. Flow conditions in the Surficial Aquifer are very slow, and therefore, semiannual monitoring is frequent

enough to identify any movement in the contaminants. For example, as discussed at the January 2001 RAB meeting, the velocity of the water in the Surficial Aquifer is estimated to be on the order of 2 feet per year, and the contaminants move more slowly due to attenuation processes. Therefore, the distance the contamination might move between semiannual events, if it moves at all, may be as little as 1-2 feet, affording time to detect movement before contaminants migrate off-site.

Comment No. 2: [Commenter selected Alternative 5] "I am concerned about the use of chemical munitions and disposal of radioactive waste on site. More information should be presented publicly so any concerns can be addressed and remedied."

Response No. 2:

The Army conducted extensive background reviews during the Remedial Investigation (RI) and sampled for materials which may have been disposed of at J-Field. Actions taken to date have considered these RI data.

A brief summary of the field investigations conducted to date in the J-Field Area includes:

- 72 groundwater monitoring wells installed.
- 271 groundwater samples taken.
- 607 soil samples (total) taken.
- 54 sediment samples taken.
- 100 acres of geophysical surveys to identify subsurface anomalies.
- 71 surface water samples taken.
- 2 Removal Actions conducted.

Over $15,000,000 has been invested to date in environmental investigations for the J-Field Study Area. The Army's investigations have been extremely thorough. There is no need for further investigation of the DSERTS sites covered in this ROD. The Army also will continue its program of keeping the public informed of the results of its studies and investigations.

Comment No. 3: [Commenter selected Alternative 7] "Why are the activities at J-Field before WWII not known? Certainly records were kept; you are using too general the proposition that APG isn't aware of the specific explosives and chemicals that were used."

Response No. 3:

Prior to passage of environmental laws beginning in the 1970s, records regarding disposal activities were not required to be kept by the military or by the private sector for environmental/pollution control purposes. However, some operating records have been found. As provided in Appendix C of the J-Field Remedial Investigation (Argonne, 1998), the Army conducted a comprehensive and exhaustive search of APG's available records during the RI process.

The Army knows of no additional records that have not been searched. The record search during the RI included:

- Historical photographs.
- Interviews with long-time employees.
- Organizational History Files of Edgewood Arsenal, 1917-1942.
- Organizational History Files of Chemical Warfare Center 1942-1946.
- Organizational History Files of the Technical Escort Unit 1942 to 1985.

Based on this search, there is a reasonable understanding of the types of materials used at APG. Although specific disposal records are not available, it is likely that some portion of these materials were disposed at J-Field. The RI included looking for these types of materials, in addition to more conventional environmental contaminants. Response No. 2 outlines the effort associated with this remedial investigation effort. Although records of the precise activities conducted at a given location may be incomplete, the RI was wide-reaching enough to account for these uncertainties.

Comment No. 4: [Commenter selected Alternative 7] "I'm in agreement with the recommended alternative. This indicates that the contaminants will be confined in a defined area while being reduced in concentration. Since there appears to be no urgent timeline to meet in future development of this land, the government can continue to monitor the situation and address future technologies that apply. I think the overall situation is cost effective with this alternative."

Response No. 4:

APG acknowledges and agrees with the statements in the above comment that the Selected Remedy is the appropriate one at this time. As indicated in the Proposed Plan, the Army will continue to look at new technologies as they become available. The Army appreciates the commenter's input in this regard.

Comment No. 5: [Commenter selected alternative 7] "I feel alternative #7 is the best method at this time. Although I believe the Army is acting in a sincere manner, please keep everyone informed about this serious environmental problem. I have lived in Bowley's Quarters for five years and only now have begun to understand completely how things we did years ago impact us now. Thank you for your time."

Response No. 5:

APG acknowledges and agrees with the statements in the above comment that the Selected Remedy is the appropriate one at this time. APG has maintained a highly active public involvement and information program throughout the CERCLA process. It is the Army's intent to actively solicit input from the community and to involve the community through the decision-making process. APG will continue to keep the community informed and involved in remediation decisions and appreciates the community's involvement in these decisions.

3.4 COMMENTS FROM THE MARCH PUBLIC MEETINGS

A full transcript of the public meeting is at Administrative Record repositories. Following is a summary of the comments made at the meeting.

Comment No. 6: A resident suggested the Army consider using the lower aquifer as an irrigation system during dry spells.

Response No. 6:

APG will further evaluate this suggestion. Several factors will affect the feasibility of this option. One of the goals of the phytoremediation grove is, of course, to draw water from the aquifer, and for this reason, it is intended that the tree root systems reach into the deeper portion of the Surficial Aquifer. It is possible that surface irrigation would tend to direct the roots to shallower zones. Therefore, the balance between the need for deep roots, and the desirable goal of using Confined Aquifer water for supplemental irrigation, must be evaluated. The evaluation will also consider potential negative consequences of pumping such as, but not limited to, the effect on the movement of contaminants. The Army appreciates this suggestion and will consider this during remedial design and operation.

3.5 WRITTEN COMMENTS RECEIVED

COMMENTS FROM ABERDEEN PROVING GROUND SUPERFUND CITIZENS COALITION (APGSCC)

APGSCC is the recipient of Technical Assistance Grants (TAGS) from the U. S. Environmental Protection Agency. These grants allow APGSCC to hire consultants to help them review and comment on technical documents. The following comments have been prepared by Dr. Cal Baier-Anderson of the University of Maryland.

"For a decade, APGSCC has worked closely with APG and the EPA in the remedial efforts at J-Field. We have provided comments throughout the remediation process."

Comment No. 7: "APGSCC would have preferred to see a more aggressive groundwater treatment plan, however, we understand that the nature of the contamination and the site geology make this technically impractical, such that we concur with the preferred remedial strategy.

Response No. 7:

The Army also would have liked to be able to implement a more aggressive groundwater treatment plan. The Army has considered and tested a variety of technologies over the past 10 years to attempt to actively remove or treat the contaminants in the Surficial Aquifer. As summarized in the various test reports and the FS, the performance of these active technologies has been limited by site-specific constraints such as the high heterogeneity and low permeability of the aquifer. Furthermore, the testing and modeling conducted during the FS suggests that because of these aquifer limitations and the high degree of natural degradation in the marsh areas, active treatment does not fundamentally improve the overall removal of contamination in the long term. One of the potential advantages of the passive phytoremediation trees is that they can be planted in large numbers at moderate cost to influence the groundwater.

The Army will continue to look for new technology that might be developed and would be effective at this site. This will be formally reviewed in the CERCLA 5-Year Review process. However, ongoing review of emerging approaches will continue in the interim.

Comment No. 8: "We would, however, like to express our concern that the Proposed Plan may give the false appearance that the remedial actions at J-Field mean that it is now "safe" and can be cleared for unrestricted use. Since we know this is not the case, it is extremely important that the Proposed Plan and the Record of Decision (ROD), which will follow, present an accurate assessment of risks present at J-Field. For example:

The documents should state that while chemical contamination under an industrial future use scenario may not pose a significant risk to human health, the presence of unexploded ordnance and chemical agent precludes unrestricted use until appropriate mitigating measures are technically and economically feasible. Moreover, active open burning/open detonation sites at J-Field, not included in these investigations, may also be contributing significant contamination that will require cleanup in the future. APG will undoubtedly face increasing political pressure to find new uses for its former ranges. Hazards and risks associated with a site may be ignored by those with political interests if not clearly stated. APG must be prepared to present a complete and accurate assessment of all known and suspect risks and hazards, including unexploded ordnance and chemical agent."

Response No. 8:

The Institutional Controls, which currently exist and which will be expanded as part of the Selected Remedy, will be protective of human health from the standpoint of both chemical contamination and UXO/CWM. During the CERCLA 5-Year Reviews, the Army will be looking for UXO throughout the site as well as monitoring the Shoreline Erosion Control system. If the site use changes from that currently anticipated, the Army will re-evaluate the protective measures. The remedial actions described in this ROD will not render the J-Field Study Area "safe" for unrestricted use. The CWM and UXO present at the site preclude J-Field's use as a residential area.

In accordance with DOD Policy, LUCs will be developed both for APG as a whole and for the J-Field Study Area

specifically. The LUC for APG has currently been prepared in Draft form.

As stated in the DOD guidance, LUCs include any type of physical, legal, or administrative mechanism that restricts the use of, or limits access to, real property to prevent or reduce risks to human health and the environment. Institutional Controls as discussed in the NCP and presented in this ROD, are legal mechanisms imposed to ensure that restrictions on land use developed as part of a remedy decision stay in place. The intent of the LUC policy is to ensure that land use activities in the future remain compatible with the land use restrictions imposed on the property during the environmental restoration process. A LUCIP will be developed and submitted to EPA within 6 months of ROD signature for review and agreement. The LUCIP will include restriction of Surficial Aquifer groundwater use, and restriction of the use of untreated upper Confined Aquifer groundwater unless it meets all applicable standards and criteria. This document will further clarify the required restriction and further ensure protection against exposure to UXO/CXM concerns. The Army will aggressively implement and monitor the Land Use Controls specified in the Plan to further ensure the protectiveness of these restrictions.

At present, Open Burning/Open Detonation (OB/OD) is considered one of the few safe ways currently available to dispose of explosives. Current OB/OD practices are aimed at making the process as environmentally acceptable as is possible given the nature of the operation, by conducting the operations during suitable weather conditions to control dispersion, when possible.

However, the Army is seeking alternatives to OB/OD and several alternative methods are under development. Currently, there are no Open Burning activities at J-Field. Under the LUC plans, there may be long-term monitoring for parameters from Open Detonation. During the RCRA permit application process, an outline was prepared for a unit Closure Plan. The Closure Plan will be finalized when the unit is closed.

4. BIBLIOGRAPHY

Accuscience Environmental. 2000. *Geochemical Evaluation of Arsenic and Lead Mobility, Toxic Burning Pit Area, J-Field, Aberdeen Proving Ground, MD.* August 2000.

Argonne (Argonne National Laboratory). 1998. *Draft Final Remedial Investigation Report for J-Field, Aberdeen Proving Ground, Maryland,* June 1998.

Army (U.S. Army). 1996. *J-Field Soil Operable Unit Record of Decision, Final.* September 1996.

Drummond, David D. and Joel D. Blomquist.1993. *Hydrogeology, Water-Supply Potential, and Water Quality of the Coastal Plain Aquifers of Harford County, Maryland.* Report of Investigations No. 58, Maryland Geological Survey.

GP (General Physics). 1999. Letter to Commander, Aberdeen Proving Ground. Re: J-Field Water Level Measurements Monthly Update.

Hughes, W.B. 1995. *Ground Water Flow and the Possible Effects of Remedial Actions at J-Field, Aberdeen Proving Ground, Maryland.* U.S. Geological Survey, Water-Resources Investigations Report. 95-4075. p. 39.

Otten, E.G., and R.J. Mandle.1984. *Hydrogeology of the Upper Chesapeake Bay Area, Maryland, with Emphasis on Aquifers in the Potomac Group: Maryland Geological Survey Report of Investigation No. 39,* p. 62.

Phelan, Daniel J., Lisa D. Olsen, Martha L. Cashel, Judith L. Tegeler, and Elizabeth H. Marchand.1998. *Assessment of Soil, Surface-Water, and Ground-Water Contamination at Selected Sites at J-Field, Aberdeen Proving Ground, Maryland.* U.S. Department of the Interior, U.S. Geological Survey.

USACE (U.S. Army Corps of Engineers). 1997. *Geology and Geomorphology of Aberdeen Proving Ground Aberdeen, Maryland.* (Draft). U.S. Army Corps of Engineers, Waterways Experiment Station.

WESTON (Roy F. Weston, Inc.). 2001a. *Technical Impracticability Evaluation for J-Field Surficial Aquifer, Aberdeen Proving Ground, MD.* April 2001.

WESTON (Roy F. Weston, Inc.). 2001b. *Confined Aquifer Well Installation and Abandonment at J-Field, Aberdeen Proving Ground, MD. August 2001*.

WESTON (Roy F. Weston, Inc.). 2001c. *Feasibility Study, J-Field Study Area, Aberdeen Proving Ground, MD.* September 2001.

WESTON (Roy F. Weston, Inc.). 2000a. *Explanation of Significant Differences, J-Field Soil Operable Unit Remedial Action,* Edgewood Area, Aberdeen Proving Ground, MD. Final. October 2000.

WESTON (Roy F. Weston, Inc.). 2000b. *Post Construction Survey Monitoring Program for J-Field Shoreline Protection*

Project. September 2000.

WESTON (Roy F. Weston, Inc.). 1999. *J-Field Phytoremediation, 1997 Phytoremediation Study Final Report, Aberdeen Proving Ground, Edgewood, Maryland,* April 1999.

Yuen, C.R., J.Quinn, L.Martino, R.P. Biang, and T. Patton.1998. *Natural Attenuation Study of Groundwater at Toxic Burning Pits Area of Concern at J-Field, Aberdeen Proving Ground, Maryland.* Argonne National Laboratory, 1998.

SAMPLE NEWSPAPER ANNOUNCEMENT

BUSINESS EXTRA

Starbucks breaks into Europe

Shop opens in Switzerland

By [illegible]
AP Business Writer

ASSOCIATED PRESS
Employees get ready to open the first coffeehouse in Continental Europe of U.S. Starbucks Coffee Co. on Wednesday, in Zurich, Switzerland. Starbucks says it will open in six neighboring countries by 2003.

FRANKFURT, Germany — Europe is the last frontier for one of America's greatest [illegible].

But can Starbucks Coffee Co. make it in the homeland of the leisurely street café? Is it even possible to sell Italians mere [illegible] espresso or make the French drink skim milk café au lait out of a paper cup?

After building a caffeine empire that stretches from Seattle to Shanghai to Dubai, Starbucks finally waded into continental Europe on Thursday, opening a shop in Zurich, Switzerland, the first of 650 stores Starbucks says it will open in six neighboring countries by 2003.

Until now, Starbucks has cashed in on bringing Seattle-style coffee culture to countries where coffeehouses were seen as exotic, even European, imports — the United States, Japan, Britain and even Thailand and Saudi Arabia.

But Europe itself is new territory for the Seattle-based retailer. And even chairman Howard Schultz admits [illegible] coffee on the continent can butt heads with Europe's proud coffee heritage, heavy in taste and aversion to U.S. commercialism.

"Before we came to the continent, we had to understand how the brand would coexist with the very strong coffee cultures," Schultz said Thursday in a telephone interview from Hamburg, where he was speaking at a culinary convention and checking out the German market.

Starbucks has 665 stores outside North America and 2,902 in its domestic market.

Over the next year, Schultz said he hopes to have 10 more stores in Switzerland, which is considered a good test market for Europe because it mixes German, French and Italian culture.

Then Starbucks plans to focus on the rest of the continent, which has some of the highest rates of coffee drinking in the world.

Schultz declined to say how much Starbucks was investing in the new push, but said most of the new stores would be 50-50 joint ventures with local companies.

On the continent, where mom-and-pop coffee shops dominate the caffeine scene, mega-chains like Starbucks are mostly unknown, although entrepreneurs are already trying to tap what they see as the next big trend.

"The whole specialty coffee thing incorporating takeaway virtually doesn't exist," said [illegible], an American who founded a chain of Starbucks-inspired coffee shops, called Fresso Coffee, in Frankfurt. "We didn't see the Starbucks model, so we started it."

Price is one hurdle. European coffee drinkers are used to paying as little as 30 cents for an eye-opening shot of espresso at their corner café. That compares with $1.75 at a place like Fresso.